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NOV 7 1944



# American Foundryman



*November  
1944*



ИМЕ СМИЛОН РУО БУ РОДА  
ЛУО-ЧНОС АРХЕ МА ТУ

## Plant-Wide Participation In A.F.A. Activities Creates Improved Working Conditions

**I**T probably is safe to say that never in the experience of the annual meetings of the American Foundrymen's Association were the technical sessions so well attended as they were in 1944, at the Buffalo meeting. One was impressed by the earnest and serious attention paid to both the speakers and the comments at the close of the sessions.

Proving what, you say? Proving that more and more of your men, your Supervisors and Lead Men, are seeking and looking for knowledge to help solve the many problems confronting them, to enable them to keep pace with new methods and ideas in this rapidly changing world and, most important, to reconfirm their belief in the positive fundamentals of their occupations.

It would be interesting to know if all the heads of our malleable iron foundries are familiar with this situation, and are doing everything they can to assist their forces to find the knowledge and help they are seeking.

The fountain head of practical and technical foundry information, as you know, is your own American Foundrymen's Association. Are you using it to its greatest advantage? Do you maintain a sustaining or company membership and, if so, do you recommend to your employees that they become personal members so that they may have advantage of all the technical papers and, especially, the monthly local chapter meetings?

Many malleable foundries, as well as others, feel it important that they pay at least half of their Lead

Men's dues in the Association, showing their men that they are interested in having them attend their local chapter meetings and becoming a part of them.

In addition to the valuable and interesting papers delivered at each meeting, the spirit of comaraderie developed by the chapters enables your men and yourself to discuss "knotty" questions with others in your communities, and often the answer you or they have been groping for is forthcoming within minutes.

It is my suggestion that each malleable foundryman check with his supervisory force to ascertain if there are some employees who would like to affiliate with A.F.A. I feel sure that the results will be surprising.

Just recently a malleable foundry manager put this same question up to 10 of his Lead Men, and discovered that each and everyone of them was eager to take advantage of this opportunity without delay.

Don't overlook this chance for improved working conditions, resulting from plant-wide participation in A.F.A. activities!

R. T. RYCROFT, Director  
American Foundrymen's Association

**R. T. RYCROFT**, President, Jewell Alloy and Malleable Co., Inc., Buffalo, is a director of the American Foundrymen's Association. An ardent A.F.A. worker, Mr. Rycroft was one of the organizers of the Western New York Chapter, and he has served the group as a past chairman.

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# American Foundryman

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# DRY FOUNDRY LADLES

## through Eliminating Boiling PRODUCE MORE SALABLE CASTINGS

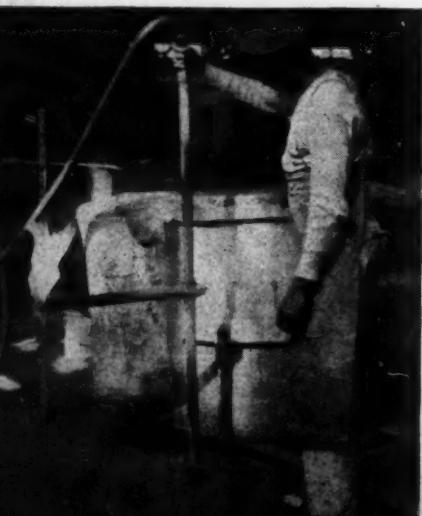
ALL iron and steel foundrymen agree that ladles of all sizes should be dried thoroughly before being used, yet in many foundries this important operation is neglected, or it is handled in a superficial manner. The term "drying" is really a misnomer, because what actually is required is a thorough baking or preheating of the ladle lining. This is essential to secure the best service from the lining and the greatest number of salable castings.

In obtaining data for this paper, personal visits were made to many foundries to observe the various methods of heating ladle linings. In addition a questionnaire was directed to approximately 2000 foundries in the United States and Canada, to obtain from them a record of their experiences with "green" linings. It was found that the use of incompletely dried linings invariably caused boiling in the ladle and that this action was detrimental to the iron and steel.

### Effect of Boiling

Boiling in newly lined ladles was found to cause inverse chill, increased depth of chill and hard spots in the castings. It causes blow holes, misruns, cold shuts, and dirty, weak iron of poor structure. It also causes minute gas inclusions in the castings, particularly in the cope section, which usually are not

Fig. 1—Gas torch for producing a mellow flame in slow drying of a newly lined ladle. Note flame issuing from "T."



\* This article, which was presented at a Session on Refractories at the 3rd War Production Foundry Congress, April 25-28, 1944, at Buffalo, shows that boiling in ladles, due to damp linings, is dangerous and detrimental to iron and steel. It emphasizes that ladles should be preheated to drive out the chemically combined water in refractory linings, and describes various methods of drying and pre-heating ladle linings.

### Presented by

C. E. BALES and F. McCARTHY  
Ironton Fire Brick Co.,  
Ironton, Ohio

discovered until the castings are being machined.

Damp ladle linings are exceedingly dangerous, since the boiling iron or steel may spill over the side of the ladle and cause severe burns to workmen. In some cases, explosions have occurred and, in one instance, 300 lb. of iron was thrown as high as the foundry ceiling. In another instance, the entire ladle lining was blown out.

In ladles handling steel, the boiling undoubtedly brings about some pick-up of hydrogen and causes porosity in the castings. In one foundry, some sand containing calcium chloride was used in the ladle linings and while the linings were apparently dry, the boiling was so severe that the entire heat had to be "pigged."

### Behavior of Damp Linings

Some foundries have experienced so much trouble in trying to remove all the water from newly lined ladles that they have given up hope and simply "pig" the first iron or steel. Such practice is an economic waste of manpower and fuel and should not be tolerated if suitable drying equipment is available.

It generally is recognized that damp ladle linings cut out much faster than those which have been dried thoroughly and preheated. The damp linings spall and crack, the cracks open on succeeding heats

and contribute to unexpected run-outs. Such linings seem to cause more trouble from slagging.

### Ladle Lining Materials

Many different types of refractory materials are used for ladle linings, and the method and degree of drying depends upon the character of these materials. In iron foundries, the following materials commonly are used:

- (1) Fire clay, silica sand and molding sand.
- (2) Fire clay, ground fire brick and silica sand.
- (3) Fire clay and silica sand.
- (4) Regular fire brick or splits, for bottom and sides.
- (5) Fire clay and ganister.
- (6) Ladle bottom tile, with fire brick or mud lining.
- (7) Siliceous ramming refractory.
- (8) Super-quality refractory bonding mortar.

In steel foundries the following materials are used:

- (1) Fire clay and ganister.
- (2) Fire brick.
- (3) Siliceous ramming refractory.
- (4) Siliceous ramming refractory with ganister.

Some foundries use silicate of soda in their ladle lining mixtures to develop a hard structure, but the authors feel that this is poor practice. The sodium silicate migrates to the lining surface, fuses when heat is applied, and causes slagging. Furthermore, the hardened surface prevents the escape of the moisture, and it is exceedingly difficult to dry such linings.

High grade fire clay consists essentially of the mineral kaolinite which contains 14 per cent chemi-



Fig. 2—Gas torch shown in Fig. 1, placed in ladle.

cally combined water. The fire clays ordinarily used in foundry practice contain some kaolinite, but they also carry quite a bit of silica, as well as some carbon and small amounts of iron and lime bearing minerals, such as pyrite, siderite, and gypsum.

The chemically combined water content of foundry clays runs from 6 to 12 per cent and, while it is possible to drive out most of this water at  $930^{\circ}$  F., the final traces may not be eliminated until a temperature of  $1450^{\circ}$  F. is reached. The loss of this water of crystallization is a function of both time and temperature and, considering the insulating power or low temperature gradient of the refractory lining, time is a very important factor.

It requires a temperature of  $1650^{\circ}$  F. to burn out all the carbon and to dissociate the siderite into iron oxide and carbon dioxide, and the pyrite into iron oxide and sulfur dioxide. A temperature of  $2400^{\circ}$  F. is required to dissociate the gypsum into lime and sulfur trioxide.

Fortunately, foundry fire clays contain very small amounts of carbon and these iron and lime minerals. However, it is essential that they be broken up by heat or they will damage the iron or steel by boiling and by sulfur absorption.

#### Importance of Preheating Ladles

The authors would like to stress the importance of both thorough drying and adequate preheating of the ladle linings. In many gray iron foundries, the metal is tapped at  $2800^{\circ}$  F. into ladles that have been preheated scarcely to  $1600^{\circ}$  F.

In many steel foundries which employ electric melting, the steel is tapped at  $3000^{\circ}$  F. or higher, into

ladles that have been preheated to about  $2400^{\circ}$  F. The authors believe that it would be much better to preheat the ladles to a temperature close to that of the metal to be received.

Ladles also should be preheated for a sufficient period of time to satisfy the heat capacity of the ladle refractories. The time required depends upon the type of refractory materials used, thickness of the lining, type of burner equipment, combustion conditions and the lining temperature desired.

Some ladles have been observed where the surface of the lining had been preheated to a bright red heat, yet the metal boiled considerably when poured into them. This was due to a short preheat time which left half the thickness of the lining still damp.

#### Vent Holes in Ladles

In a steel foundry using electric melting, studies on a 3-ton ladle with a 4-in. lining of siliceous ramming refractory showed a face temperature of  $2500^{\circ}$  F. while the temperature of the ladle shell was  $480^{\circ}$

F. This emphasizes the insulating properties of ladle refractories and shows the necessity of taking sufficient time to do a thorough job of preheating.

The authors regret that they are unable to recommend proper lining thicknesses and the time actually required for drying and preheating ladles of various sizes.

#### Methods for Drying Ladles

To thoroughly dry ladles of all sizes and to reduce the time of drying, it is recommended that the ladle shells be perforated with vent holes of  $\frac{1}{8}$  to  $\frac{1}{4}$ -in. diameter. These holes could be placed on 1-in. centers for hand and bull ladles, on 2-in. centers for ladles up to 1,000 lb., and on 3-in. centers for larger ladles. These vent holes are especially important when rammed linings are used.

Many methods are used to dry iron and steel ladle linings. In some cases a wood or charcoal fire is built in the ladle as soon as it is lined and the fire is gradually increased until the lining appears to be dry. It is then allowed to cool to room temperature and washed with a clay daub.

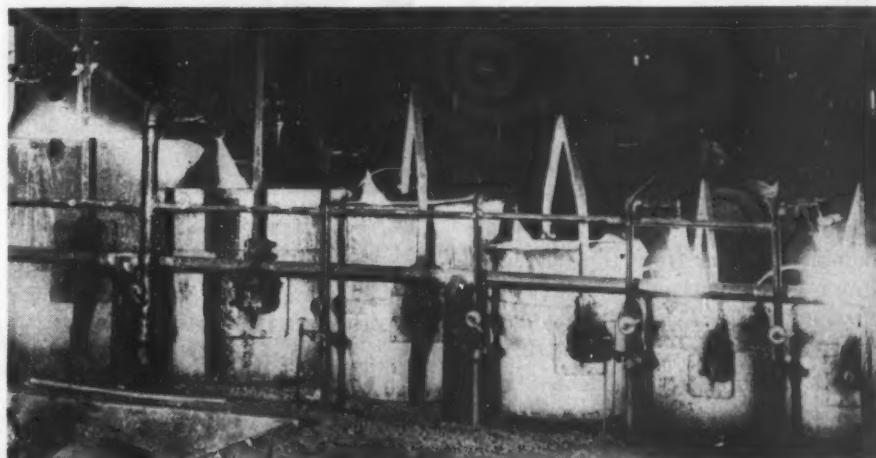


Fig. 3—Battery of torches for preheating ladles in a vertical position.

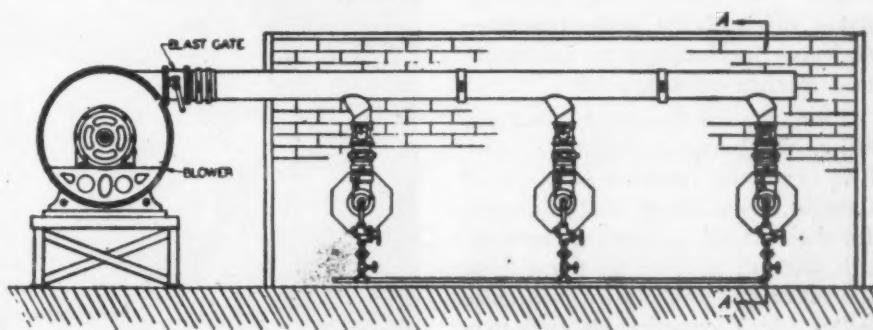


Fig. 4—General layout of a wall ladle preheater.

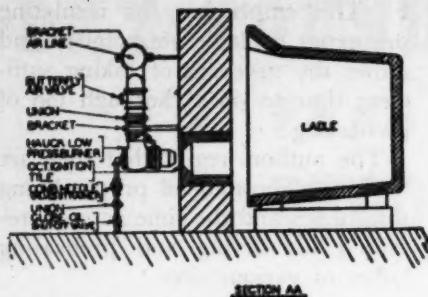


Fig. 5—Cross section of wall ladle pre-heater at "A" of Fig. 4.

Some ladles are dried over a coke fire. For others, a mellow flame, from a gas torch, is applied to the newly lined ladle (Figs. 1 and 2). Some cracks usually develop, but they are closed with ladle mud when the ladle is apparently dry.

A number of foundries now are using core ovens for drying ladles, and this appears to be the preferred method. Hand ladles, bull ladles, crane ladles, and even ladles up to 4 tons capacity, are being dried in core ovens. The temperature in these ovens will run from 500 to 600° F. The linings are heated slowly and uniformly, all of the free water is driven out and the ladles are in excellent condition for immediate preheating or for storage in a warm, dry room. After storage, the ladles must be preheated before using.

#### Methods for Preheating Ladles

After the ladles are thoroughly dried, it is necessary that they be preheated to remove the chemically combined water from the refractory lining. This is done with oil or gas torches (Fig. 3), with the ladles preferably in a vertical position.

Many ladles are preheated in a horizontal position using a wall type heater (Figs. 4, 5 and 6). While this method is effective, the ladles have a tendency to go a bit out-of-round. Also, the lining sometimes flakes off and the ladle trunnions and gear mechanisms do not maintain mechanical alignment.

From the standpoint of lining stability, the vertical method of preheating is recommended, even though it has some disadvantages. In the vertical preheating method, it is difficult to drive the flame from the oil or gas torch down into large ladles. Also, considerable fuel may be wasted and, unless sufficient secondary air can get into the ladle, a

reducing atmosphere will be present in the ladle, carbon will be deposited in and on the lining, and some damage may be done to the refractory materials.

Foundry equipment engineers now are making improvements in ladle preheaters by placing a cover around the burner and over the ladle. The cover is lined with plastic refractory and reflects heat downward into the ladle (Fig. 7).

#### Improved Method

An improved preheating method was published anonymously in the May, 1942, issue of the British magazine, "Iron and Steel." The equipment has been in operation for several years and has resulted in speeding the preheating operation and reducing cost by half (Fig. 8).

This equipment was designed for

gas, but it is felt that oil could be used equally as well. It consists of a shield, lined with plastic refractory, which can be lowered into contact with the ladle top, thus conserving heat.

A means of escape for the burned gases is provided by two chimneys, symmetrically placed in the shield. The shield was made flat, instead of conical, for the sake of simplicity.

If this device were fired by the ordinary type of burner with a single central air supply, the gas would not burn in the ladle because it would lack secondary air. Instead, it would emerge from the top of the chimneys and burn there. This difficulty was overcome by providing the burner with an outer air jacket, as in burners designed for use under water.

#### Saving Compressed Air

The air supply was taken from the compressed air mains at 75 psi. As this pressure was unnecessarily high, a saving in compressed air was effected by fitting two simple air injectors by which the high pressure air sucked in atmospheric air.

The equipment is easily controlled. Sufficient air is supplied to the outer jacket to keep the flame inside the ladle. The intensity of the flame is controlled by adjusting the central air supply. When the central air supply is reduced, the flame becomes soft and luminous.

To protect the burner, and also to ensure that the flame extends suffi-



Fig. 6—Ladles being preheated in a horizontal position against a wall heater.



Fig. 7—Improved ladle preheater. The cover is lined with plastic refractory.

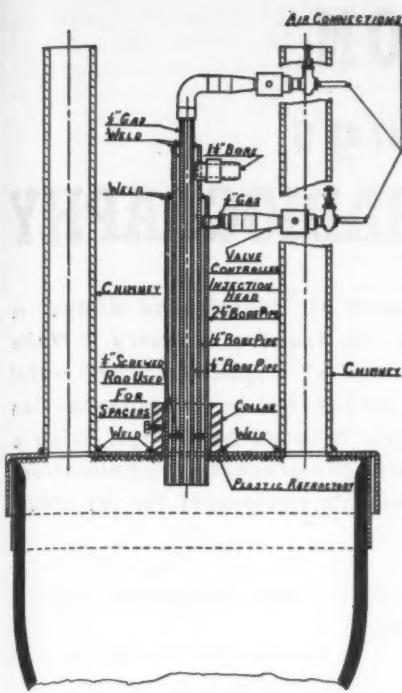


Fig. 8—Ladle preheater. Note chimneys for the escape of burned gases. Burner is provided with an outer air jacket, as in burners designed for use under water.

ciently toward the bottom of the ladle, a loose sleeve may be slipped over the burner tip and may be replaced from time to time. This refinement has been found to be well worthwhile.

#### Plastic Refractory

The inside of the shield is covered with plastic refractory, which is kept in place by pieces of expanded metal which are tack-welded to the bottom surface of the shield at frequent intervals. It is essential that this refractory lining be kept in good repair to avoid distortion of the shield.

#### Acknowledgements

The authors appreciate the data and co-operation given to them in the preparation of this paper by H. S. Austin, J. A. Bowers, Wm. Berlin, A. C. Denison, George S. Evans, E. A. Frey, Norvin E. Green, John Grennan, Henry C. Griggs, H. S. Gulick, Harry Hazeltine, Arthur C. Hintz, Joe Manning, E. C. Miller, Earl F. Minnear, A. McMeekin, C. W. Phillips, Donald Reese, R. L. Salter, Bill Setzer, F. John Schwenk, H. A. Smith, J. C. Thomas, Milton Tilley, Charles C. Trenary, C. L. Williams, C. O. Williamson, J. Harold Winn, and C. S. Whittet.

## ENDORSE NEW CHAPTER For Foundrymen in Central Ohio Area

ON Friday, October 13, a group of 25 foundrymen from the Central Ohio area, centering around Columbus, held a meeting in the Deschler-Wallick Hotel, Columbus, to discuss the possibility of forming a chapter in that area. Interest in such a movement was generated by H. Kenneth McGrath, Alten's Foundry and Machine Works, Lancaster, Ohio, who was ably assisted in stimulating interest by T. E. Barlow, Battelle Memorial Institute, Columbus, and Fred W. Fuller, National Engineering Co., representative in that area.

Mr. McGrath acted as chairman of the meeting, of which representatives of the following companies were present: Bonney-Floyd Co., Columbus, Ohio; Battelle Memorial Institute, Columbus; Ohio Steel Foundry Co., Springfield; Alten's Foundry and Machine Works, Lancaster; National Engineering Co., Chicago; Ohio Malleable Iron Co., Columbus; Marion Steam Shovel

Co., Marion; Alloy Cast Steel Co., Marion.

F. J. Walls, International Nickel Co., Detroit, and Vice-President of A.F.A., was first called upon by Acting Chairman McGrath and discussed the advantages of an A.F.A. chapter. Following his talk, the chairman called upon N. F. Hindle, of the A.F.A. National Office, to discuss methods of financing the chapter. All present were given an opportunity to discuss the pros and cons of chapter formation, and the meeting ended with an enthusiastic endorsement of the formation.

As a result of the endorsement, it was decided to hold the first meeting of members in that area on November 21, with H. W. Dietert, Harry W. Dietert Co., Detroit, as the speaker. Members, and others interested in the formation of a chapter in the Central Ohio area should get in touch with H. Kenneth McGrath, Alten's Foundry and Machine Works.

## A New A.F.A. Publication . . . Recommended Practices for NON-FERROUS ALLOYS

Information contained in this important New A.F.A. publication has been compiled by the Recommended Practices Committee of the A.F.A. Brass and Bronze Division, and the Committee on Sand Casting of the A.F.A. Aluminum and Magnesium Division. A book that provides non-ferrous foundrymen with accurate, up-to-date data for the production of practically any non-ferrous alloy casting, and enables them to check present production practices against accepted standards and wide experience. An indispensable reference work wherever non-ferrous metals are cast . . . compiled by many leading foundrymen and metallurgists. Contains 159 pages, 42 tables, 35 illustrations; cloth bound.

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Molding Practice . . . Finishing Practice . . . Melting and Pouring . . . Heat Treatment . . . Causes and Remedies of Defects . . . Properties and Applications . . .

#### For the Following Alloys:

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- High-Strength Yellow Brass and Leaded High-Strength Yellow Brass (Manganese Bronze). • Tin Bronze and Leaded Tin Bronze. • High-Lead Tin Bronze. • Leaded Nickel Brass and Bronze Alloys (Silicon Bronze). • Aluminum Bronze. • Aluminum-Base Alloys. • Magnesium-Base Alloys.

**\$2.25 to A.F.A. Members — Order Your Copies Promptly!**

# FLUOROSCOPIC INSPECTION of Light Metal Castings USED TO SUPPLEMENT RADIOGRAPHY

THE use of fluoroscopy (visual examination of the internal nature of an object on a fluorescent screen) for industrial X-ray inspection has generally been confined in this country to the examination of auto tires, packaged goods, citrus fruits and shoe-fittings. At the present time, however, considerable research is underway to establish the best operating conditions for the fluoroscopic inspection of aluminum and magnesium aircraft castings.

These investigations should prove as fruitful for fluoroscopy as have analogous studies for radiography in recent years, whereby sensitivity has been improved, X-ray tube design bettered, electronic control applied and certain undesirable types of cassettes, holders, etc., eliminated.

In anticipation that specifications will soon be issued to include fluoroscopy for routine control inspection

\* This article from the April, 1944, issue of "Metals and Alloys" is reprinted because of its interest to the foundry industry. While radiography is the conventional method of inspecting light metal castings, increasing interest is being manifested in visual inspection (i.e. without a permanent photographic record) by X-rays, using a fluorescent screen. The article discusses the process, its applications and its limitations, and describes available equipment for its industrial use.

By

ROBERT TAYLOR  
Consulting Radiologist  
Pullman, Wash.

of certain types of castings, X-ray equipment manufacturers have designed and are now selling machines suitable for fluoroscopic inspection on one hand or through electronic attachments for optional fluoroscopic or radiographic examination, on the other; the latter type are conveyor-

ized for high production requirements.

The fluoroscopic method is most useful as a method of "preselecting" castings, with relatively gross defects for subsequent radiographing. It is especially valuable for the inspection of cored passages in castings and as a tool for the general control of foundry practice. Properly applied it can cut down in large measure the great amount of X-ray photographic work (radiography) now applied to light alloy products.

## Present Application

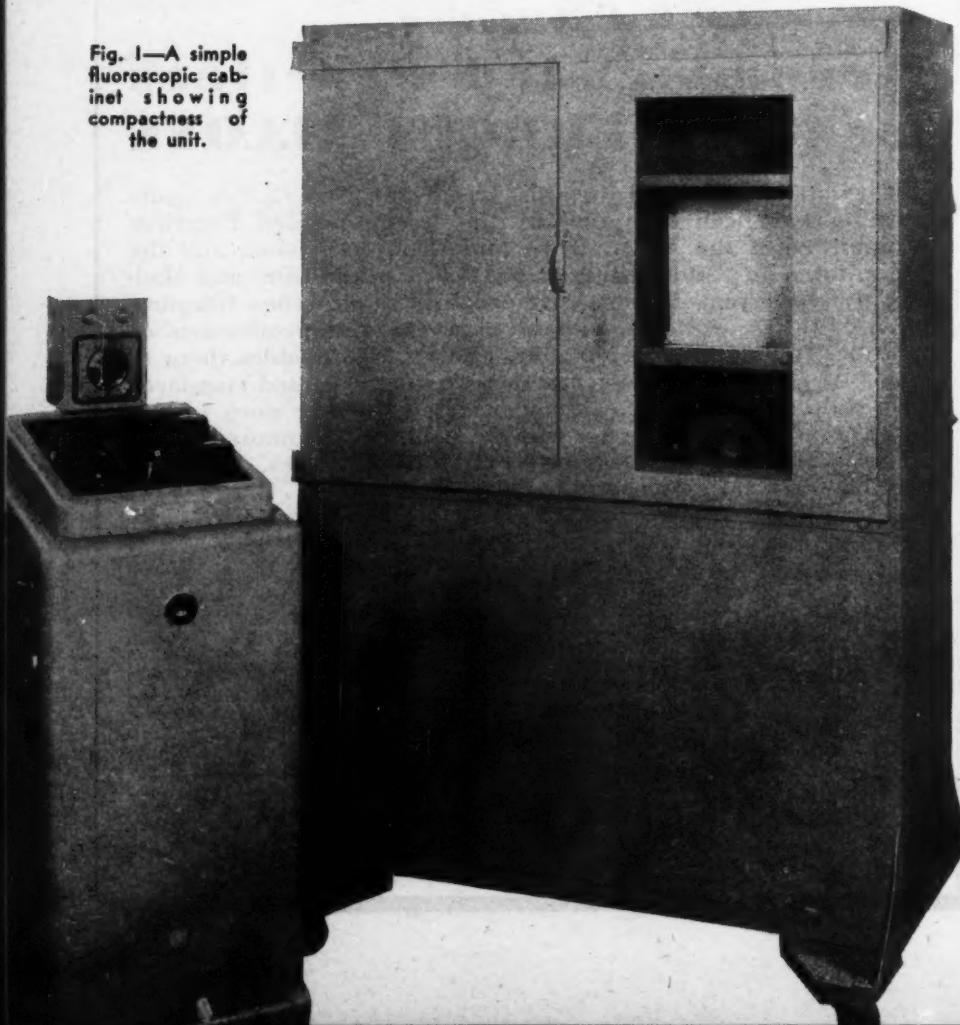
This method of inspection has been carried out in Great Britain as the following quotations from specifications of the Aeronautical Inspection Directorate indicate:

21. There are two types of radiological examination,
  - (a) By X-ray photography, referred to as radiography, and
  - (b) By visual examination, using a fluorescent screen, referred to as screening. Radiography is a much more sensitive method than screening.

Suitable castings may be examined by screening, within the limits imposed by their size and shape, and with regard to the suitability of the X-ray equipment. Light alloy castings having a maximum cross section of 2 in. in any part and of such shape that manipulation will allow the X-rays to penetrate each part of the specimen so that a readable shadow is produced on the fluorescent screen, are suitable specimens for examination by screening. Steels, copper alloys and other heavy metals are in general unsuitable for examination by screening. They must be examined radiographically where radiological examination is specified. Very minute flaws, such as an intercrys-talline porosity, cannot be detected with certainty by screening.

23. It is to be clearly understood that screening cannot be regarded as accept-

Fig. 1—A simple fluoroscopic cabinet showing compactness of the unit.



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able where facilities are not available for moving the casting about in the X-ray beam, as efficient screening demands that the specimen be maintained in continuous movement while the fluorescent screen is carefully scrutinized. The specimen must be manipulated by the use of tongs or a remote handling device; the operator's hand must not be used for the purpose whether enclosed in a protective glove or not. Care is to be taken during screening that the area of the screen illuminated is not excessive.

An important factor which gave impetus to the designing of fluoroscopic machines has been the drain on film manufacturers during the war. Another factor for important consideration was the matter of economy of inspection concerned wherein with radiography the cost of film, processing solutions and operators' time all had to receive vital consideration.

#### Evaluation of Fluoroscopy

In evaluating fluoroscopy, it is first essential that the sensitivity of the process be thoroughly and accurately determined. The standard sensitivity gage called the "penetrometer" required by the various Government agencies and committees to determine the degree of sensitivity present in any particular inspection procedure are quite satisfactory for use in visualizing the sensitivity of the fluorescent image.

One fact should be clearly understood at this point—that fluoroscopy is not to be considered a substitute, but rather a supplement to radiography.

A sensitivity of from 3 to 5 per cent and upwards, depending on the design and thickness of a casting, is possible in fluoroscopic inspection, whereas a 2 per cent sensitivity is required in most specifications; for example, Army Air Forces specifications require a 2 per cent penetrometer sensitivity for aluminum alloys and a 3 per cent penetrometer sensitivity for magnesium alloys.

At the present writing, it would appear that the fluoroscopic method of inspection should be most valuable as a means for pre-electing castings with relatively "gross" defects, and also as a means of examining cored passages in castings, especially those for aircraft engines wherein cored passages are at times numerous, and in the foundry as a tool for inspecting and controlling the foundry technique. It should, if properly ap-

plied, cut down the great amount of radiographic inspection being carried out on light alloys.

#### Sensitivity of Method

The sensitivity of a method or process should be clearly understood. The penetrometer acts as a sensitivity gage and is, in fact, a basic calibration device. In stating the penetrometer sensitivity at 2 per cent we can not necessarily state that the sensitivity for micro-shrinkage is 2 per cent. There are such factors as scattered radiations within a casting which must be considered.

We might standardize on a particular casting and state that in this casting there is an acceptable degree of micro-shrinkage, produced or shown on a film or screen, with a penetrometer sensitivity of 2 per cent, and in this we are safe in employing the technique used for the exposure of that particular casting for 2 per cent sensitivity.

The point is that the penetrometer sensitivity is not necessarily the sensitivity of a particular discontinuity. It is, rather, the sensitivity that would be shown if a penetrometer wedge of the same alloy were radiographed or fluoroscoped with the same kilovoltage, milliamperage, focus-film distance and time of exposure.

#### Scattered Radiation

The sensitivity actually obtained is, as a rule, inferior to the penetrometer sensitivity, owing to the presence of scattered radiation and unfavorable overlapping of sections of the casting. For example, if sections  $\frac{1}{2}$  in., and 1 in. in thickness overlap, the technique is required to give a penetrometer sensitivity for  $1\frac{1}{2}$  in., i.e., capable of revealing a slot 0.03 in. deep, but this means no better than 6 per cent in the 0.5-in. section and 3 per cent in the 1-in. section. If there is considerable scattered radiation, the actual sensitivity obtained may be correspondingly worse.

The ability to discover a defect within a casting depends to a considerable extent on the shape and size of its image on the fluorescent screen, a fact that must be considered in stating the exact sensitivity of the method.

Although the sensitivity obtained with the penetrometer is the basic calibration factor, the characteristic

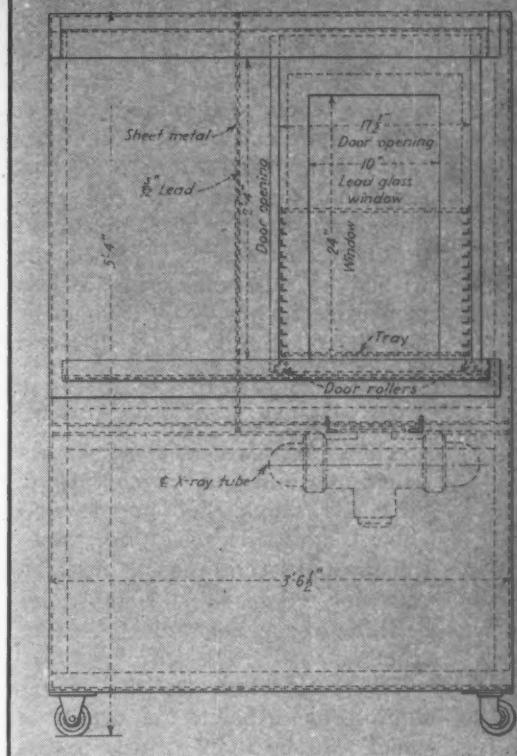


Fig. 2—Drawing of the fluorescent cabinet.

differences in legibility of the images of various types of discontinuities must be considered in viewing the image. It might be a good starting practice to determine sensitivity by actual sectioning of a casting for visual inspection of actual faults and then determine the penetrometer sensitivity required to reveal each type of flaw.

For instance, the permissible degree of micro-shrinkage, as estimated by the microscope, having been prescribed for a particular class of castings of a particular alloy, might be detected at a penetrometer sensitivity of 3 per cent.

This being the case we can state with certainty that the penetrometer sensitivity must be established at 3 per cent for that class of castings. If we can visualize a penetrometer sensitivity by fluoroscopy of 3 per cent when viewing complicated castings, this should ensure a sensitivity of 5 per cent for all parts of the casting.

A method for determining the sensitivity of an image on the fluorescent screen may be accomplished by building a step-tablet of the alloy to be inspected and graduating the tablet in steps of three, varying in thickness, say from  $\frac{1}{2}$  to  $\frac{3}{4}$  to 1 in., and then superposing over each thickness 5 penetrometers ranging from 2 to 10 per cent in increments of 2 per cent.

By viewing the image on the screen the penetrometer sensitivity

may be readily determined; for example, if we can perceive the 3 per cent hole for each thickness we may state that our sensitivity for each thickness is 3 per cent, as illustrated by the penetrometer. (Since the writing of this manuscript, such a penetrometer has been devised by Dr. S. W. Smith of Kelly-Koett Mfg. Co.)

#### Equipment Available

There are two types of fluoroscopic machines to be considered. First the simple fluoroscopic machine, designed solely for fluoroscopy and second the combination, conveyor fed machine designed for both fluoroscopic or radiographic inspection.

Figure 1 illustrates the simple fluoroscopic cabinet, the details of which can be more readily understood from the drawing, Fig. 2. The cabinet is of all welded steel construction with the fluoroscopic chamber completely lead lined.

In order that the observer be out of the path of the direct beam, a "periscope" principle is employed, using a 45-degree front surface mirror which the observer views through a lead glass window. The fluoroscopic screen and mirror assembly are made into one unit with a lead glass front, gasketed so as to be dust proof and fume proof for protection of the mirror surface. A series of guides are arranged at 1-in. intervals and the screen and mirror assembly can rest on any chosen pair of guides.

The work to be fluoroscoped is placed on a bakelite shelf below the screen which fits on to the same series of guides as the screen and

mirror assembly so that the shelf can be placed within 1 in. of the screen, or as close as the size of the casting permits. The lead glass window on the front of the cabinet is made large enough so that the operator can look through it regardless of the height of the screen.

This window is placed right in the access door which is mounted on rollers in such a fashion that it can be readily slid to one side. A safety switch insures that the X-rays are turned off as soon as the door is opened.

With this arrangement, the X-ray tube is below the screen, which means that the parts are conveniently below eye level for easy replacement. In order to improve visibility by masking out the uncovered parts of the fluorescent screen that are not covered by the casting, there is built into the cabinet a manually adjustable lead shutter for control of the area of the screen to be viewed.

#### Details of the Conveyor Cabinet

The conveyor cabinet is essentially a line-production unit with built-in conveyor for continuous fluoroscopy or radiography or both. It is so constructed that it can be integrated with any production line.

If required, a conveyor of this type can be extended through safe lock doors directly into the processing room. The over-all dimensions are approximately 14 ft. 4 in. in length by 3 ft. 3 in. wide by 8 ft. high and is constructed of all-welded frame, the X-ray chamber being completely lead lined.

The X-ray tube is at the top and

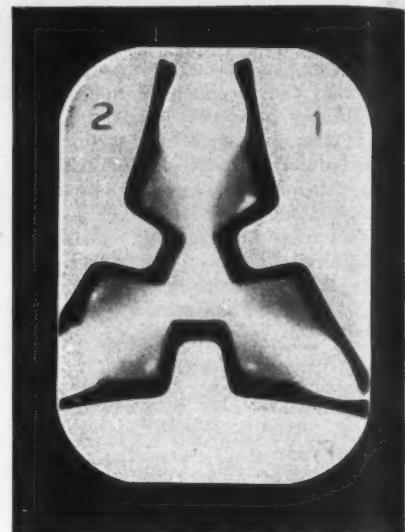


Fig. 4—Group of three castings positioned as for fluoroscopy in which the porosity and shrinkage was readily visualized.

is adjustable in height for any target-screen distance from 18 to 30 in. The tube is rigidly supported and the cables extend out from the top, using conventional "post-hole-digger" type of cable and which, if hand room is limited, may be reduced from the standard 4 ft. 2 in. length to as little as 14 in.

The conveyor embodies a series of bakelite trays, 23 altogether, suitable in size for a 10 by 12-in. film, the trays moving at approximately 8 ft. per min. The use of bakelite trays in lieu of a belt of canvas, leather or some other material, has many advantages, some of which are:

1. Any soft or fibrous material suitable for use as a belt will catch and hold particles of metal, dirt, dust, etc., which would appear in the fluorescent screen as dark inclusions in the specimen being inspected. Bakelite with its smooth, hard surface will cast off most of such particles, and fine dust which may collect may be easily wiped off.

2. A worn or broken belt requiring replacement or repair would necessitate a complete shut-down of the unit. Similar damage to a bakelite tray can affect only one tray at any one time and replacement can be made during a normal shut down period, with continued operation in the meantime with a negligible loss in production rate.

The conveyor can move forward or in reverse and the fluoroscopic observer can move it in either direction or stop it at the command of a foot switch. If desired, additional

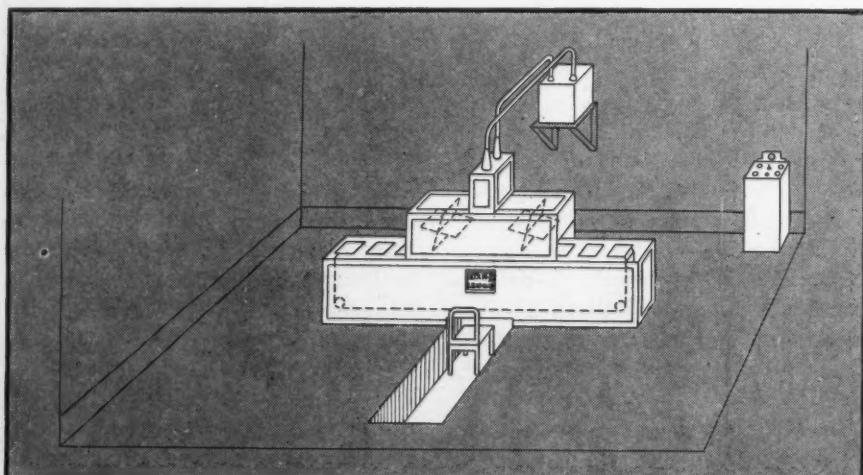


Fig. 3—Schematic drawing of conveyor fed, combination fluoroscopic-radiographic production machine.

switches can be connected to permit stoppage of the conveyor by other workmen assigned to loading or unloading the castings. The observer views the specimen much the same as in the simpler fluoroscopic machine described above.

The problem of adequately sealing with lead the openings at the end of the cabinet through which the conveyor passes was solved in a very ingenious manner. Within the cabinet are placed two paddle wheels, one for each end of the cabinet, each paddle being driven by the conveyor drive motor and consisting of four lead blades 15 in. long and 15 in. wide except at the end, which is narrowed sufficiently to pass between the two chains that comprise the conveyor drive.

#### Position of Paddles

In any position of the paddles there is complete obstruction to the passage of radiation to the outside of the cabinet, yet the blades themselves cannot interfere with the bakelite trays or with the specimens placed upon them.

The cabinet is also equipped with a manually adjusted lead shutter for diaphragming out the undesired beam of radiation, as explained in the description of the simple fluoroscopic machine.

In order that the trays are at a convenient height for loading, for example, 36 in. from the floor, the observer's chair should be set below floor level in a small pit. Normal eye level for a seated person is, as a rule, 48 in. from the floor.

#### Hinged Door

In order that the center of the mirror is at this height, the pit should be constructed 20 in. below floor level. It is suggested that the pit be equipped with a hinged trap door than can be dropped into a covering position when fluoroscopy is not being carried on so as to have this portion of the floor covered when radiographic inspection is being carried out.

Arrangements should be made for handling the specimens with tongs in order to view all sections of a casting and this may be accomplished by including a small door at the side of the mirror, wherein the operator with the use of tongs can adjust the specimen to any desired position.



Fig. 5—Large blow-holes (gas) in aluminum alloy sand casting easily visualized on the fluoroscopic screen.

This has been accomplished for the combination machine, but it has been omitted from the drawing.

Operators performing fluoroscopic inspection should remain at this work for a period not to exceed 2 hrs., after which a relief operator should be assigned. A rest of an hour is sufficient for an operator to return to his screen viewing.

The value of fluoroscopy in certain classes of X-ray inspection should not be underestimated. It has been carried out abroad with success and there is little doubt but that it will find a place as a valuable adjunct to radiography in the inspection of materials.

Grateful acknowledgement is extended to both The Kelly-Koett Mfg. Co., Inc., of Covington, Ky., and to the R. P. Kincheloe Co. of Dallas, Texas, for the illustrations of the machine. The machines described are a product of Kelly-Koett; other X-ray equipment manufacturers also make fluoroscopy machines and fluoroscopic-radiographic combinations.

#### Bibliography

"Fluoroscopic Examination of Light Alloy Castings," presented by A. R. Cartwright of Montreal, Canada, to the American Foundrymen's Assn., at the annual meeting of this society at St. Louis, April, 1943.

"Radiographic Inspection of Light Alloy Castings," by G. C. Laurence, L. W. Ball and J. Archibald, The Nat'l. Research Council, Ottawa, 1942.

\*Kelly-Koett Mfg. Co., personal communications,

## Symposium on Centrifugal Casting Ready for Mailing

AMONG the first publications to be released by the Technical Development Program of the American Foundrymen's Association will be the forthcoming "Symposium on Centrifugal Casting." This 208-page paper bound book will contain 12 well illustrated articles by leading authorities on the centrifugal casting process.

The following articles are reprinted from the 1944 "Transactions," including the papers presented at the 3d War Production Congress in Buffalo: "Centrifugal Castings" by Peter Blackwood and John Perkins; "Centrifugal Casting of Steel" by C. K. Donoho; "Spinning Speeds of Centrifugal Casting Machines" by F. G. Carrington; "Precision Casting by the Investment Molding Process" by Robert Neiman; "Design and Safe Operation of Centrifugal Casting Machines" by James G. Weber; "The Influence of the Centrifugal Process on the Physical Properties of Some Non-Ferrous Alloys" by W. W. Edens and J. F. Klement; "Centrifugal Casting of Non-Ferrous Metals" by I. E. Cox.

The remainder of the articles are papers on centrifugal casting which are included to make this a comprehensive reference manual. These are: "The Hows and Whys of Centrifugal Casting" by Harold B. Zuehlke; "Slush Pump Cores Produced by Centrifugal Casting Process" by A. E. Falk; "Production of Centrifugal Gray Iron Castings in Water Cooled Molds" by H. W. Stuart; "The Sand Spun Centrifugal Process for Making Cast Iron Pipe" by James F. MacKenzie; and "Centrifugal Casting and Equipment" by Nathan Janco.

This book will be ready for mailing early in November, 1944, and will be available to members for \$2.00 a copy.

To avert a let-down in production on V-E Day—Victory Day in the European War—the Hamilton Foundry and Machine Co., Hamilton, Ohio, is distributing among its employees a card asking the workers to indicate their plans for that day. The management is taking this means to maintain production.

# 1945 WAR PRODUCTION

## Foundry Congress of the Association

### SET FOR DETROIT, APRIL 30-MAY 4

FOR 1945 it's the Motor City—with Detroit Chapter playing host to the 49th annual meeting of A.F.A. during the week of April 30-May 4.

Selection of Detroit by the Board of Directors means that the 4th War Production Foundry Congress will be held in a district whose gigantic efforts on behalf of war production have played a great part in the success of Allied arms. Even though V-E Day may, as all of us trust, be reached by the time of this important meeting, the concentration will be on making this a War Production Congress that may help speed the coming of V-J Day as well.

Thus, throughout the program, emphasis will continue to be placed on those matters which will have a direct bearing on the ability of the Foundry Industry to bring both V-Days nearer.

It is expected that a number of important contributions in the form of technical papers will be presented by men connected with the automotive industries. In tonnage of castings produced, Detroit is one of the greatest foundry centers in the country, and it is known that many outstanding developments in foundry practice have been made in the plants of the auto makers.

#### 3d Foundation Lecture

Since establishment of the A.F.A. Foundation Lecture in 1943, this feature of the annual program has attracted large attendance. The 3d Foundation Lecture, to be presented at Detroit, will be the work of Dr. H. A. Schwartz, Manager of Research, National Malleable & Steel Castings Co., Cleveland, on "Solidification of Cast Metals." Dr. Schwartz is internationally known for his basic research in metallurgical fields, and his 1945 lecture paper, because of its fundamental nature, will be of major importance to every branch of the foundry industry.

The Program and Papers Committees of A.F.A. are already at work planning programs of interest to

every branch of the casting industry, and some excellent papers have already been submitted for review. For example, major emphasis will be placed on non-destructive testing by the Steel Division. A feature of the Malleable Division program will be the fourth annual symposium, this time dealing with sand practice for malleable foundries.

#### General Interest Subjects

Sessions on engineering properties of Gray Iron, which were well received at the Buffalo Congress this year, will be continued. Complete programs will be offered for the Aluminum and Magnesium Division and the Brass and Bronze Division, the latter featuring melting phases of brass. In addition, programs now are being developed covering many subjects of general interest such as pattern making, foundry sand research, job evaluation and time study methods, foreman and apprentice training, refractories, and inspection of castings. Outstanding sessions are planned for these and other subjects, including the work being done on welding of castings by a joint committee of A.F.A. and the American Welding Society.

It will be recalled by those who attended the last Detroit Convention of A.F.A., in 1936, that the Motor City offers exceptional facilities for plant visitations. Selection of Detroit for the 1945 Foundry Congress was made partially in the expectation that some of the most interesting plants might again be available for inspections by visiting foundrymen.

#### Strong Local Interest

In addition to the interest being shown in the 1945 Foundry Congress by the Engineering and Research Departments of some of the big motor car companies, success of the meeting will be assured by the enthusiasm of A.F.A. men not only in Detroit but throughout the state. Both the national President and Vice-President of A.F.A. are Michigan men—President R. J. Teetor of Cadillac Malleable Iron Co. at

Cadillac, and Vice-President F. J. Walls of International Nickel Co., Detroit.

Under the leadership of Chairman R. G. McElwee, Vanadium Corp. of America, the Detroit Chapter of A.F.A. has expressed its enthusiasm and unanimous desire to make the 1945 meeting a complete success. This Chapter has long been one of the strongest and most active of all Association Chapters and Foundry Congress Committees soon will be appointed.

#### Housing Arrangements

Because of the many large steel, malleable, gray iron, magnesium and brass foundries in Michigan, a large local attendance is expected, in addition to many out-of-state foundrymen. Insofar as it has been possible to estimate expected attendance, ample housing facilities have already been arranged. All room reservations will be handled through a highly experienced and competent Housing Bureau which is already functioning in Detroit. This Housing Bureau will work closely with all Detroit hotels and with A.F.A. to see that all desiring accommodations are adequately and promptly taken care of.

It is planned to mail hotel reservation application blanks from the A.F.A. office about December 1, and the Housing Bureau has been instructed to commence the making of room assignments at least three months in advance of the Foundry Congress. Because of existing conditions, it is hoped that foundrymen who expect to attend the Detroit meeting will make reservations for hotel accommodations much farther in advance than has previously been the general practice of the industry.

#### 100% Technical Program

No exhibit has been planned in connection with this 49th annual meeting of A.F.A. in Detroit, so that the equipment and supply industry can concentrate on plans for exhibiting at the 50th Anniversary Foundry Congress in 1946.

# INCENTIVE FUNDAMENTALS

## through Good Management

## HELP SPIN WHEELS OF PROGRESS

THE usual types of incentives are for industries which make parts for assembly into units for ultimate sale. They are the kind most often described in texts, articles, and speeches. However, there is still much to be learned about the better practices in this field. Therefore, the attempt will be made here to describe those methods of development, which will help to produce better and more lasting results.

### Incentive No Cure-All

To begin with, there has been far too much "trial and error" and too much mental laziness with regard to incentive operation. As John W. Riegel says in his very illuminating article in A.M.A. Personnel Series 77, "Managers court disaster if they think they can buy an incentive plan, install it, and have a carefree existence thereafter . . .".

Riegel partially emphasizes this in another connection, when he says, "... the qualification of methods and time-study men have been too narrowly conceived by many managers. Heads of standards departments should be industrial-relations minded to a considerable extent, so that they will select, train, and supervise their time study people accordingly."

The point here is that you "can't get something for nothing." Incentive is not a simple cure-all. It is an exceedingly important fuel that will turn over the industrial engine. Along with it however, must go supervision, maintenance, and lubrication of a very high order, if the motive force is to continue to function properly.

### Time Study a Philosophy

It is unfortunate that so much has been said and written about only the technique of time study, because it is self-evident that time study is much more of a philosophy than a mechanic. The very word "incentive" implies a psychological force, and yet we are too inclined to at-

tempt to rely upon mathematical and technical procedures in working with it.

• This paper, originally presented at the May 3 meeting of the Society for the Advancement of Management, in Philadelphia, is published in the interests of the A.F.A. Job Evaluation and Time Study Committee. The author, through his articles in the AMERICAN FOUNDRYMAN and by his lectures at local and national A.F.A. meetings, is well known to Association Members.

By  
PHIL CARROLL, JR.  
Management Consultant  
Maplewood, N. J.

tempt to rely upon mathematical and technical procedures in working with it.

Therefore, to begin with, management must be made to realize that the bulk of the good arising from the use of incentive comes about only through proper administration. And, in order to make a good installation and see to it that it is properly administered, it is necessary to have time study men who are mentally capable and professionally strong.

It may be out of order to mention it here, but it seems to me that if more time study men looked upon their work as a "profession" instead of a trade, they would less often go along with compromises and expedients which distort the fundamentals of the incentive plan they have helped to create.

### Management Attitude

Incentive should not be started until after it is certain that management knows what it is supposed to do and can be relied upon to fully carry its share of the responsibility. This stipulation is necessary because a properly organized standards department is strictly a staff function. It cannot properly go beyond advising and guiding the line organization.

At the same time, a successful installation of wage incentive cannot be left to depend upon the ability of a staff organization to "sell its product." There are times when "customers refuse to buy," no matter

how attractively the product may be displayed. In such instances, management must insist upon an impartial trial.

These remarks do not refer to the usual conception of "backing" because, when matured and qualified time study men are doing their jobs, squabbles over details should be practically non-existent. The point emphasized has more to do with correcting such things as the negative reactions which may arise from departments indirectly affected, and organized effort in any area that may be set up to impede progress.

### Worker Participation

Having made certain that the management of the organization and the personnel of the standards department are of the right type and have the right attitude, it is fair to assume that they would agree to the next step which seems second in importance. This point of procedure involves the training of shop men in all of the time study methods, fundamentals, and policies. Such training is recommended as one of the elements affecting success, and not because of labor unions' viewpoint.

The War Labor Board has approached this phase of the problem by insisting upon a joint management-labor request for approval of the installation of a wage incentive plan. It is more important to have collaboration when the shop is organized, because of the unfortunate tendencies to use grievance procedures for the determination of solutions to alleged time study errors. These grievances arise because the pressure is on for "more money," particularly today, and because pressure is always on union officials to

get something for their membership.

Time study is another one of those so-called mysterious subjects about which management is becoming more inclined to inform those concerned. Informing has its limitations. So does collaboration. And, if we keep in mind that the final success of a wage incentive plan depends upon the attitude of those in the shop, then we have to go beyond the lecture method to fully inform.

Responsibility would be divided, but the important point is that it is a pure waste of time to permit a debate to go on between two parties when one is almost totally ignorant of the subject.

#### Knowledge Important

One answer to the problem is found in training. To this end, shop men should be given training to the point of expertness and, if a union is involved, the men should be union officials. They will know their subject thoroughly, while at the same time, presumably, they retain the confidence of their fellow workers.

The recommended procedure is important for many reasons. Two will be touched upon here. In the first place, many union criticisms about standards, which I have heard, start off something like this—"the man took 20 minutes to make a piece during the study and you allow him only 15 minutes." Neglecting the element of pressure for "more and more money," the basic fundamental involved here is the "rating" of the performance observed.

#### A Common Ground

Now, until the critics are trained to see that there is not necessarily any close relationship between the actual time taken and the standard which should be allowed, a discussion about fairness is interminable. There can be no common ground for a meeting of minds. It seems like a foregone conclusion, therefore, that complete training in time study procedures is a necessary part of any satisfactory solution to criticisms of all kinds, particularly that one having to do with answering the question, "What is a fair day's work?"

The second important reason for bringing shop men into the time study department is to round it out with technical trade skill. Besides, of course, the shop point of view and worker attitude will be added gains.

Without these attributes in the standards department, it would be futile to attempt the installation of an incentive plan in some industries. Here is where the third step of importance needs to be developed.

#### Total Measurement

Those of us who have watched recent trends have thoroughly regretted the hastily-conceived expedient known as "plant-wide" or "coverage" plans. Even so, we have only ourselves to blame. We have stuck to certain practices which are no longer adequate to solve the problems. We have insisted upon perfecting the job before setting the standard, timing only the skilled operator, setting standards from individual time studies, and other time-consuming techniques which prevent us from ever getting to the complete measurement of industrial activity.

Consequently, we have seen plans adopted and put in over night for the purpose of allowing incentive earnings to so-called indirect labor, as an example. We have seen the abortive use of guaranteed past-earned rates on day work time because we have failed to set standards for irregular conditions.

#### Obsolete Methods

It is high time that we did some thinking for ourselves and recognize that some of the methods we have used for half a century are obsolete. They are inadequate for solving some of today's problems.

Too many fellows who call themselves time study men argue that you cannot put certain jobs on incentive because "the conditions vary all the time," "the operator has never had any training," and "the work is in small-lot quantities."

What they mean to say is that they do not know how to measure the work done. All they have to do is stop to think for a minute that, if they do not do something constructive toward a solution, the problem will be taken out of their hands, as it has been in many cases where large groups and even entire plants have been given an incentive opportunity overnight.

What we are leading up to is the increased necessity for using the standard data method for setting standards. And here is where the technical skill brought in from the shop is utilized to translate standard data into shop-operation times pre-

determined before the one-piece orders get under way.

The standard data method is generally understood, so that there is no reason to discuss it in detail. However, it may be permissible to dwell upon several of its advantages as they fit into this and the later discussion. At this point, it should be emphasized that today, more than ever before, it is necessary to continue time study effort until complete measurement is reached. The obvious ultimate result is either that correct work standards will be established or wage increases will be granted, which, basically, is a real result of the currently-used "coverage plan" for indirect labor.

#### Rate of Progress

Standard data offers one solution to the next problem of importance; namely, the element of speed. Speed is a relative matter and, of course, the expedient of plant-wide incentive or coverage plan was adopted because it could be put in over night, where some felt they could not wait for time studied standards.

Standard data fits in between the over night solution and the commonly-experienced long-time installation by direct time study. One basis of comparison recently made showed that between 2 and 20 per cent of the number of time studies taken to set standards by the individual rate-setting basis were required to build up the standard data necessary to get the same complete coverage. In addition to the substantially greater time efficiency of the standard data method, its development contributes considerably to the solution of our next problem.

#### Method Change

The question of guaranteeing standards is ever-present under any good incentive plan. The question is so important that we see numerous references to it in the current literature.

One of the important new developments is implied in the statement that changes in standards to conform with methods improvement should affect only those parts of the standard which change as a result. One union contract says that the changed elements of the job are the only ones to be restudied—a narrow and impractical restriction.

On the other hand, we have a different consideration today which is

well-stated in Professor Riegel's\* article, previously referred to, as follows: "Today managers hesitate to make corrections for fear of labor trouble. Clearly, such temporizing cannot be continued indefinitely without causing inequities in standards to grow and to become vested rights. Furthermore, under the Wage Stabilization Program, failure to make such corrections is equivalent to the granting of unauthorized wage increases, and this lays the employer open to serious penalties."

Now, since we must make changes in order to maintain consistency of earning opportunity and also to keep out of the clutches of Wage Stabilization enforcement, we must have the means to do it quickly and equitably. Standard data offers that means in the majority of instances. Moreover, the elements of work which are eliminated can often be removed without the necessity of a time study which may involve a clash in personalities and also possible variation in effort rating incident thereto.

From the other point of view, since we can expect methods improvement and changes in standards to be forced upon us by industrial progress, then we come to the next point of procedure which bears upon incentive installation.

#### Perfecting the Job

Most of us were taught (I know I was) to perfect the job and working conditions before setting the standard. That appears to be a method originally devised to overcome two difficulties: First was the problem of determining a normal amount of work. That since has been largely overcome by learning how to rate the effort observed during the time study. Second, the method has been used in an attempt to avoid subsequent changes in standards. This point of view is static in that it assumes industrial progress will stop with the method set up prior to time study.

Someone has said that "nothing is so permanent as change" and, therefore, it seems silly to attempt to side step that problem. It seems much more constructive to set up the proper mechanisms for solving the problems of changing standards, because change will be with us always.

\*Director Bureau Industrial Relations, University of Michigan.

Moreover, a proper procedure has an extremely important bearing upon the rate of progress of an incentive plan installation. If much of the delay and the waving of magic wands which earned the odious name of "Efficiency Expert" can be avoided, we can much more readily solve some of the current incentive problems with the sound foundation of time study based standards.

#### Suggestion Plans

Looking from effect to cause, it would appear as though the attempt to avoid subsequent method changes are futile from another standpoint. The reason is that there will be improvements, and many will be introduced by the operators themselves.

Standards become loose and perhaps production restricted when management does not follow up on method changes, as previously pointed out, or when operators introduce improvements which are utilized for their gains, but which are not revealed to the company. Here is where the Suggestion Plan comes in. Most of those in effect seem to be wholly inadequate. My belief is that the rewards are too niggardly.

The rewards must be sufficiently attractive to induce the operator to reveal his improvements. When he does so, he initiates the change in method and thereby overcomes much of the psychological hazard. The reward itself should be based upon the change in the standard, and it follows that the question of amount of downward revision is also settled automatically. Here again, established and recorded standard elemental data contributes greatly to a more satisfactory solution to method-change problems.

#### Measurement of Variations

But, you say, if you do not perfect the methods before you set the standard, there will be great inconsistencies between time allowances for comparable operations, parts, and products. I would counter by saying that you are arguing from an idealistic point of view and forgetting that it is a matter of degree.

Inconsistencies will exist, even if the jobs are perfected beforehand, because of variations in the skill and judgment of those who establish whatever methods are adopted. That is not a reason for failing to seek perfection, but it is pointed out to

emphasize another error in approach that seems to have been overlooked.

Said another way, and considering that wage incentive standards should be used for many other more important controls of the business, such as pricing, budgeting, and inventory turnover, another type of solution is required in order to do the whole job of measurement without introducing substantial errors. With the method to be proposed, the presence of potential method change can be clearly indicated without bringing in the indefinite postponement of incentive application while waiting for the changes to be introduced.

The proposal cannot be utilized without carrying on the best of elemental breakdowns in the time studies themselves. When those are available, the only question to be answered is, "Which of the elements are to be considered as belonging with normal working conditions?" The remaining elements which must be allowed for so long as the process requires are to be treated as extra work or expense.

#### Two Advantages

The simple device outlined has two main advantages beside circumventing the delay to the installation already mentioned: First, it is a procedure which should be used in all subsequent cases when working conditions deviate from those established as normal, and when the operator must be protected for extra effort required. Second, and this is competitively sound, it establishes a means for determining the economics of the proposed improvement.

In using such an expense measurement, it will be found that many improvements, even obvious ones, cannot be paid for out of the savings which would result with the quantities being manufactured currently. However, the separation of the expense from the productive parts of the operations allows the continuous reporting to management of potential savings which may be made at some time when cheaper improvements are developed or output increases to the quantity necessary to justify the change.

#### Assembly Standards

The separation of expense from productive effort is extremely important in the establishment of standards for an assembly department.

# UNITED STATES TREASURY DEPARTMENT

*For patriotic cooperation shown in behalf of the  
War Finance Program this citation is awarded to*

## American Foundryman

*Given under my hand and seal on Aug. 30, 1944.*



The reason is that very often parts are sent to assemblies which require filing, fitting, and burring. Much of this type of work will be reduced, if not eliminated, at some future date when dies are perfected, specifications are more clearly established, quantities are increased to the point where better methods are warranted, or, and this is important, those working on the fabrication operations are required to complete their work to quality standards.

Much of the fitting, filing, and burring can be done more economically in the fabrication department, even if it is found to be necessary. And it is important that it be done there in those plants which profess to make interchangeable parts that may be sent out for service repairs.

### Beginning An Installation

With that object in mind, it is often advisable to begin the installation of an incentive plan in the assembly department. Such a procedure has its disadvantage in that manufactured parts may not be supplied at a rate sufficient to keep the assembly department going. On the other hand, that work which is to be transferred back to the manufacturing department would necessitate the establishment of new standards in part, if measurement had already been put into effect there before the assembly department was studied.

Having set some of the foundation stones, we can begin an installation

of incentive in almost any department. Literally, that is usually the case, because incentive is most often started to put "grease on the squeaking wheel." By that is meant that many different forces may bring about the beginning of a wage incentive installation. Very often, it is undertaken to overcome some kind of a bottleneck in production. Today, of course, there are added reasons. Unfortunately, many of these are attempts to beat the Wage Stabilization Act.

### Where to Begin

Logically, an incentive should be started at the beginning. The point is that it is much easier to have increased productivity taken up by subsequent departments than it is to draw added requirements from previous departments which are not on incentive.

However, regardless of where the beginning is made, the first step of importance is to have a completely convinced management representative meet with those working in the initial department. He should convincingly state not only what is expected of the workers and what they will get out of it, but also what management expects to furnish and what it will get out of a properly-operated incentive plan.

Then, too, it should be emphatically stated that base rates of pay will be guaranteed and that premium-earning opportunities can pro-

vide an addition to the take-home approximating 20-25 per cent for those who want to work. Finally, it should be stated that standards are guaranteed except for changes in method, equipment, tooling, and quality.

The manager should not attempt to give details regarding time study procedures or methods of premium calculation. These should be left to the explanations made by the time study men during the many opportunities they will have in the course of observing the operations preparatory to compiling standard data.

After the preliminary introduction has been completed, studies should be concentrated upon some type of work which can be completely set up in data form. This procedure can be hastened if someone in charge of the work will map out a program of study that will encompass the complete range of the variables involved with a minimum number of time studies.

### Correct Rating

The minimum is secured by using two details of procedure: First, by insisting that all time studies taken must be analyzed and recorded with complete detailed breakdowns into elements; second, by planning the time study so that no unnecessary studies are taken of the common varieties, but that the extremes, both large and small, are observed as quickly as production of them can be arranged.

These studies should be correctly rated for performance and the proper relaxation added to each element in the conversion to normal standard times. After these values are computed, they should be posted to a large sheet of paper called a comparsion sheet. From this, the variable elements should be plotted on curves set up to measure the relationship between dimensional factors and standard element times. Most of the guidance of the chief time study man should be directed toward the completion of the variable analysis because this controls the time element of progress.

The completed element data will consist of a list of constant elements with their standards plus one or more curves for the variables. These should be combined for simplicity and accuracy in standard setting. The ideal solution would be obtained when all of the standard data can

be combined so as to furnish the total standard as one figure.

Ordinarily, the ideal solution is not economically practical because too much time and space would be consumed in its preparation. As a rule, the elemental standard data is grouped into totals conveniently obtained and utilized in combinations to set standards for the usual run of work. These groups are made up of elements which usually occur together in some typical parts of the regular operations.

#### Setting Standards

Standard data is never actually completed because industrial progress inevitably makes necessary some changes and additions. However, when that which currently applies has been completed, the setting of operation standards can be started. The standards should be set up for a selected few and applied when enough standards have been established to keep the work of those involved completely measured.

It is good practice to start with only a few people for two reasons: Ordinarily, it is quite a task to set up all of the standards required to keep the work 100 per cent on incentive; secondly, and more important, the foreman in charge has a lot of new duties to perform which he has not yet learned. It is important to avoid giving him an impossible task and creating a lot of confusion by giving him more work to do than he can handle. In the solution to this training problem, the time study man can assist by supplying the answers to questions that will be asked by both foreman and operators.

#### Getting Under Way

Foremen and time study men must work with the operators to assist them to earn premium. This effort must be persisted in until they earn extra money practically every day. It is advisable in this early stage to inform the operators regularly about their progress. To this end, the so-called Posting Sheet used with certain incentive plans is advantageous.

It is put up in the department to show every one interested the rate of performance and the premium earned by all those on incentive. At the beginning of the installation, this sheet should be calculated so that those on incentive will know almost immediately how they are "making

out." This is an important detail bearing directly on the changeover from promises to realization. Naturally the fuller confidence in the promised benefits does not accrue until after several substantial premium checks have been received.

Nevertheless, those in the department who are not on incentive will be encouraged and influenced by those already on who succeed in surpassing the standard times and earning premium. Normally, they will ask, "When do I go on incentive?" From then on, the pressure is on the time study department to set standards more rapidly and extend the coverage.

If the remainder of the department is measurable by the standard data already completed, all that is involved is so much hard work to establish the required standards on a production basis. On the other hand, when additional sets of data must be developed, it will probably be necessary to have some of the time study group proceed with the study and analysis of one or more of the remaining types of work, while some members are assigned the problem of completing the determination of standards for the work measurable by the data already completed.

#### Departmental Measurement

As a rule, one department should be completed before another is undertaken except when two or more departments can be measured simultaneously. Every effort should be made to set up standards for both direct and indirect, especially when setups are numerous.

The measurement of setup is necessary because it is a large factor in the determination of proper lot sizes for manufacturing and, obviously, of lot costs. Also, generally speaking, it is one of the large items of indirect labor found in the usual metal-processing plant. On the other hand, inspection, which may be a large item located within the department, would not be included in the prescriptions for completing the department because, as a rule, inspection would be responsible to supervisors of quality and not of production.

#### Supervision Premium

The importance of completely measuring a department hinges upon the necessity for gaining complete control of the payroll within that

department and the establishment of incentive for the supervisor.

It is necessary to provide incentive for the supervisor because he can do a great deal toward the control of his labor cost. Moreover, it is desirable to determine an incentive basis for the supervisor in order to give him an opportunity to increase his earnings. Otherwise, the differential between his "take home" and that of the men responsible to him will close up.

#### Standard Time Units

Of necessity, incentive for a supervisor is established on a budgetary basis. A standard cost is established for measured production. This measure should be in terms of standard time units, so that whatever is accomplished in one department is comparable to the results obtained in others.

Part of the incentive paid to the supervisor should be based upon the progress he shows in reducing the payroll cost per standard time unit of output toward the standard established. Another part of his reward should come from the average rate of performance as measured by the productivity of his people. Other factors may be considered, but those two form the major proportion of a good incentive measure for supervisory performance.

The supervisory measurement would include all of the payroll directly under the control of the foreman. This is important and contrary to some plans which operate by charging out of the cost of the department such items as are said to be beyond the control of the foreman.

The recommended method makes the foreman directly responsible for the payroll cost of all time under his jurisdiction. In effect, he is in business for himself. He gets credit for the standard time equivalent of all good pieces completed and is charged with all of the payroll expense.

His cost improvement, and hence part of his premium, results from increasing the number of good pieces completed for a given payroll or through a better utilization of productive time by decreasing the payroll for a given number of good pieces. Naturally, his premium is directly affected by scrap and faulty workmanship, waiting time and ex-

cess non-productive labor, and whatever "make-up" time may have to be allowed for those who fail to attain incentive performance.

#### Measuring Results

A cost control, such as has been briefly outlined, serves another important purpose. It supplies the means with which to measure the effectiveness of the incentive installation. Experience has shown that progress measured in terms of reduced cost per piece is faulty.

This was emphasized by the president of one company who said, "Yours is the third outfit that has been in here and the first one to bring down the actual cost." What he meant was that others had set standards on some parts of the work, probably the easy jobs. While those had been turned out more efficiently and premiums paid for the results, the cost had not declined on the unmeasured work and idle time. The net result was that the total payments were greater than before.

Now, if the total number of good pieces produced as measured by standard time units does not increase for a given payroll, no progress has been made in labor cost reduction. Therefore, the control established for the payment of supervision premium can serve admirably to indicate exactly what is happening with the payroll cost of a unit of output.

That type of factual indicator is very important at any time, but it is very necessary today when the War Labor Board requires evidence of the results of an incentive plan it has approved.

#### Management Functioning

Several elements vital to good wage incentive operation have been touched upon in the preceding discussion, but they should be brought together here by way of summarizing and pointing out where management has an important part to play. The establishment of expense allowances, previously described at length, points up the biggest area of activity for management action.

Added to those allowances which may be made initially to measure the difference between actual and those conditions specified as normal, there are the day-to-day allowances made for variations in working conditions. All of these taken together represent substantial amounts of extra cost which may be converted to salable

## Insignia Lapel Pins Available to Members



Enlarged replica of sterling silver lapel pin

**A**s a service to those members who have requested lapel pins bearing the A.F.A. insignia, the National Office is pleased to announce that a supply of one-half-inch pins, made of sterling silver, are now available to the membership. The pins may be purchased from the various chapters or from National Headquarters for one dollar each.

production or savings in cost.

Then there is the relatively large amount of delay time, at least in the initial stages, which will indicate the need for better planning. In waiting time, every plant has wasted manpower which can be converted to greater productivity or reduced costs.

These and similar items of lost time are much more important than the average time study man thinks. His thinking is too frequently geared to the 80 cents an hour paid to the operator, when he should give more consideration to the overhead costs of perhaps 10 times as much.

According to Snyder, in his book entitled "Capitalism the Creator," the average work station in industry represents an investment of \$10,000. That is too large a sum of money to be standing idle any appreciable portion of the time. Therefore, important changes in cost can be brought about by the better utilization of the operator's time. While it is obvious to most of us that no overhead savings result unless the total output is increased, or part of the assets disposed of, it is in line with constructive thinking to make every effort to fully utilize the working day.

To this end, the proper reporting of lost time has much greater utility than many managements understand. They are too inclined to look

at the clerical cost of reporting and think it is more important to save this expense than the substantially greater one of excessive plant capacity. The greater profits lie in the more effective use of plant capacity.

Then we should not forget that a good wage incentive plan based on standard data permits management to predict much more closely what their costs will be when considering new business, new products, and new methods. Some of these elements of progressive business will be very vital again in the not-too-distant future when we are back on a competitive basis.

We will have to compete with each other and with the industrial nations of the world, many of which we have equipped for and trained in high production methods which were largely American before this war. When that time comes, the plant-wide or coverage plans will be no more than they are today, simple wage incentive plans designed to pay more money for more output. They supply no cost facts, nor any means for predicting what the individual part or order should cost. Some of those plans will be going out with war products. But those which remain will have to be replaced by individual measurement if the industries using them expect to compete successfully.

#### Good Management Is Vital

Thus, it should be readily apparent that the bulk of the results of good wage incentive operation can be brought about only by the exercise of good management. The operator may work harder, but if he waits longer, the overall costs will probably be the same or higher. The supervisor can strive to operate his department more effectively, but if the normal working conditions are not reasonably well maintained his operators may become somewhat dissatisfied, and the supervisor will make little or no premium.

The time study man can work earnestly to set up standards which the producers will agree are entirely fair but, if the wage policies are inconsistently operated, the incentive plan may be badly distorted. Management must understand how to operate good wage incentive, maintain an active interest in it, and work diligently to earn the benefits which can be derived only in proportion to its own effectiveness.

# STUDENT INTEREST Stimulated by Chapter Work

The program of youth encouragement in foundry careers, sponsored by the Apprentice and Junior Foundrymen Committee of the Chicago Chapter, calls for close cooperation with local trade schools. To stimulate student interest, B. L. Simpson, Committee Chairman, offered prizes for the best essays on "Why I Would Like to Work in a Foundry" to those taking foundry courses at Washburne Trade School and Crane Technical High School. The winning paper in the Washburne group was presented in the October issue of AMERICAN FOUNDRYMAN, and the paper published below is the best entry submitted in the Crane competition. It was prepared by John Fronter, who is now serving with the U. S. Army. Second and third place winners at Crane Technical High School were Richard Sosnika and Christ Kamberos.

THERE are quite a few reasons "why I like to work in the foundry." The first and most important reason is that this is one of the most promising industries of today.

In the foundry there is always a chance for advancement for an intelligent and willing young man, because so many students embarking on a career classify it as a dirty old shop and, consequently, overlook its possibilities. Also, many of their parents are ignorant to the fact that the foundry has improved in recent years, like many other industries. And today the modern foundry is near the top on the list of cleanliness.

Metallurgy and the molding rate second in importance in why I like this industry. The metallurgy of metals is a large field which only has been partially opened to the public in the last 50 years, and many new developments will occur in the next 50 years.

## Future Possibilities

Molding in a foundry is not just an everyday routine which becomes monotonous in due time. Rather, molding is an art which grows more interesting and equally important as the days pass. Making a difficult mold is the pride of any molder, bringing him closer to his work and making it more interesting.

The industry has a large scope which embraces all metals and metal alloys, including one of the newest finds, magnesium, which many predict has excellent future possibilities.

Moreover, most of the executive positions in the foundry field today are held by men who worked in the

shops in their earlier years, these men always are willing to help a young man reach his goal so that the industry itself may expand.

Another reason for my choice is that the foundry is one of the biggest industries in the world today. Its products are used in all parts of the universe and in almost every phase of modern living. Without foundry products, the world would be almost helpless and people would have to revert to the cave man age.

This would be caused by the loss of many taken-for-granted products, a few of which are: everyday household equipment and appliances, automobile and airplane engines, locomotive engines, large structures and farm machinery. Now, with a great war waging, the field has enlarged to include numerous parts for ships, guns, and tanks which are

essential to our fighting men. The foundry also can take credit for its part in our modern means of transportation because foundry products are an essential part of all types of transportation equipment.

These are just a few of the considerations which have convinced me that the foundry is one of the most important industries in the industrial world of today!

## A.F.A. Fellow Reports on Foundry Sand Research

THE Foundry Sand Research Committee on Physical Properties of Steel Foundry Sands at Elevated Temperatures met in Cleveland, Ohio, during the recent convention of the American Society for Metals, on October 18, to hear the report of the A.F.A. Fellow at Cornell University, Ithaca, N. Y., and to discuss problems in connection with the basic research program under way at that institution.

A.F.A. Research Fellow Douglas C. Williams presented some very interesting information on the reproducibility of high temperature test results and upon the single variable program which is now being conducted at the University.

Results of work done since the 1944 annual meeting of A.F.A. were discussed in detail, and will be published in the Fifth Progress Report, to be made available at the time of the 1945 annual meeting of your Association in Detroit.

## An Up-to-Date REFERENCE MANUAL . . . for the Modern GRAY IRON FOUNDRY

A revised A.F.A. Committee publication of authoritative information on the properties, application and production of alloy cast irons.

This revised edition of the ALLOY CAST IRON book contains a correlation of practical knowledge advanced by outstanding authorities on the production and application of alloy cast irons. The 282 pages of text matter contain 96 tables and 123 illustrations, all dealing with the latest alloy gray iron manufacturing methods.

CONTENTS: 1. Metallurgical Principles of the Effects of Alloying Elements in Cast Iron. 2. Effects of Alloying Additions in Cast Irons. 3. Effects of Alloys on the Physical and Mechanical Properties of Gray Irons. 4. Ladle Inoculants. 5. White and Chilled Alloy Cast Irons. 6. Heat Treatment of Alloy Cast Irons. 7. Foundry Practice for Alloy Cast Irons. 8. Specific Applications of Alloy Cast Irons. 9. Index.

• The 6x9 clothbound book contains data on the qualitative and quantitative effects of alloys . . . forms available . . . methods of addition . . . casting practice . . . heat treatment . . . service and test data . . . specific applications . . . extensive bibliography . . . and a comprehensive cross index.

• Elements discussed include Aluminum, Bismuth, Carbon, Chromium, Cobalt, Copper, Magnesium, Manganese, Molybdenum, Nickel, Phosphorus, Silicon, Sodium, Sulphur, Titanium, Tellurium, Tungsten, Vanadium and Zirconium.

• Just off the press, this revised edition of the ALLOY CAST IRONS book is a "must" in the gray iron foundryman's reference library. PRICE: \$2.75 to A.F.A. MEMBERS.

AMERICAN FOUNDRYMEN'S ASSOCIATION

222 WEST ADAMS STREET

-1-

CHICAGO 6, ILLINOIS

## **Cast Iron Specifications Proposed by A.S.T.M.**

**C**OMMITTEE A-3 on Cast Iron, American Society for Testing Materials, has submitted for letter ballot to its members two proposed specifications, the first on automotive gray iron castings, and the second on gray iron castings for pressure-containing parts for temperatures up to 650° F.

The proposed tentative specification on automotive gray iron castings is a revision of a previous specification covering the same type castings. Included in the specification are typical base iron compositions and residual and alloy ranges and uses.

The proposed tentative specification for gray iron castings for pressure-containing parts for temperatures up to 650° F. is a new specification developed by Subcommittee XXII of Committee A-3, in cooperation with the Gray Iron Division Committee on High Temperature Properties of Cast Iron of the American Foundrymen's Association.

Up until the present, most applications of gray iron have been limited by specifications to 450° F.

An investigation by the War Metallurgy Committee, National Research Council, in cooperation with the above-mentioned A.F.A. Gray Iron Committee, brought additional support to the conclusions given in the "Cast Metals Handbook" that the effect of heating and cooling cycles, up to 700-800° F. on fine grained irons, was negligible, so far as internal corrosion in steam was concerned,

and that growth was not a serious factor up to 700° F. in sound castings of good design.

The above specification is based upon conservative limits and is confined to irons of A.S.T.M. classes 40, 50 and 60. The iron specified may be used in applications at temperatures up to 650° F., but the specification specifically covers applications between 450 and 650° F.

## **COURSE OF 24 LECTURES Included in 3d Metropolitan Program**

**P**ROMPTED by the success of the two previous lecture courses on the fundamentals of foundry engineering, the Metropolitan Chapter, in cooperation with the Stevens War Industries Training School, is offering a third series of lectures, sponsored by the United States Office of Education.

Like the preceding programs, the sessions are being held at the Stevens Institute of Technology, Hoboken, N. J., beginning October 13, 1944, through January 5, 1945. In all, 24 lectures will be given, tuition free, in a course that is formulated to

assist foundrymen, design engineers, X-ray technicians and others to broaden their knowledge of casting operations in furthering foundry war production work.

The course was organized in 1943 by Dr. Alfred Bornemann, Associate Professor of Engineering Chemistry, Director of Pierce Metals Laboratory, and the Committee on Cooperation with Engineering Schools of the Metropolitan Chapter. A complete program of the various sessions in the 1944-45 schedule is shown elsewhere on this page.

### **1944-45 Metropolitan Lecture Course Schedule**

- |   |   |
|---|---|
| Oct. 13, 19— <i>Solidification and Cooling Phenomena.</i><br>W. C. Schulte, Propeller Div., Curtiss-Wright Corp., Caldwell, N. J. | Dec. 8— <i>Melting and Pouring Bronze.</i><br>H. L. Smith, Federated Metals Div., American Smelting & Refining Co., Pittsburgh.   |
| Oct. 20— <i>Casting Design.</i><br>R. E. Ward, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.                      | Dec. 14— <i>Melting and Pouring Aluminum and Magnesium.</i><br>A. MacIntosh, Wright Aeronautical Corp., Paterson, N. J.   |
| Oct. 26, 27— <i>Pattern Design.</i><br>J. E. Martin, U. S. Navy Yard, Brooklyn.   | Dec. 15— <i>Cleaning of Castings.</i><br>Fred Mosley, Whitehead Bros. Co., New York.  |
| Nov. 2, 3— <i>Gating and Risering.</i><br>H. F. Taylor, Naval Research Laboratory, Anacostia Station, Washington, D. C.           | Dec. 21— <i>Annealing and Heat Treatment.</i><br>FERROUS ALLOYS: J. S. Vanick, International Nickel Co., Inc., New York.<br>NON-FERROUS ALLOYS: R. E. Ward, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J. |
| Nov. 9— <i>Molding Methods for Sound Castings.</i><br>F. G. Sefing, International Nickel Co., Inc., New York.                     | Dec. 22— <i>X-Ray, Gamma Ray, Magnaflux and Zygo Inspection Methods.</i><br>A. Gobus, Sam Tour & Co., Inc., New York.   |
| Nov. 10, 16— <i>Sand Testing and Sand Binders.</i><br>G. Watson, American Brake Shoe Co., Mahwah, N. J.                           | Dec. 28— <i>Foundry Costs.</i><br>J. L. Carter, Gray Iron Founders' Society, Inc., Newark, N. J.  |
| Nov. 17— <i>Effect of Sand and Facings on Castings.</i><br>W. R. Scott, Foundry Div., Wright Aeronautical Corp., Paterson, N. J.  | Dec. 29— <i>Foundry Control.</i><br>F. G. Sefing, International Nickel Co., Inc., New York.   |
| Nov. 23, 24— <i>Permanent Mold and Die Castings.</i><br>A. Sugar, U. S. Metals Refining Co., Carteret, N. J.                      | Jan. 4, 5— <i>Engineering Economics in the Foundry.</i><br>G. W. Barnwell, Stevens Institute of Technology, Hoboken, N. J.  |
| Dec. 1— <i>Melting and Pouring Cast Iron.</i><br>J. A. Bukowski, Worthington Pump & Machinery Corp., Harrison, N. J.              |   |
| Dec. 7— <i>Melting and Pouring Steel.</i><br>C. H. Cline, Cooper Alloy Foundry Co., Hillside, N. J.                               |   |

# A.F.A. PAYS TRIBUTE TO W. M. Saunders, Sand Research Pioneer

W. M. SAUNDERS, pioneer in sand research, and one of the original members of the joint committee formed in 1921 on molding sand research, died September 22 after a long illness. For many years, Mr. Saunders was one of the leading investigators of foundry sand, and was the originator of several methods for determining the properties of sand. He is known particularly for his work and origination of the die absorption test and for his standardization of numerous other tests.

Mr. Saunders was born in Johnston, R. I., in 1866, was educated in the public schools of Johnston and Providence, and received his higher education at Massachusetts Institute of Technology and Brown University. His chief interest at the time of his graduation was chemistry.

In 1901, he started a commercial chemical laboratory, and in 1902 formed the partnership of Saunders & Franklin, a general testing and analytical chemical laboratory. In 1928, the partnership was dissolved, and Mr. Saunders continued in his own name.

Mr. Saunders was a member of the American Foundrymen's Association from 1902 until his death. He established an enviable reputation in the New England territory for his work and was recognized nationally for his work in molding sand.

When the original joint committee on molding sand research was formed in 1921, Mr. Saunders became a member. When the joint committee was dissolved and the activities taken over by the American Foundrymen's Association, Mr. Saunders remained a member of the committee and served as chairman from 1923-26. In addition, he served as a member of the Executive Committee of the Foundry Sand Research Committee of A.F.A. and as a member of the Committee on Conservation and Reclamation, Committee on Tests and Subcommittee on Definition of Terms.

Mr. Saunders also served as A.F.A. representative on a committee advisory to the U. S. Bureau of Standards. He was extremely active in a number of other organizations, including the Iron and Steel and Insti-

tute of Metals Divisions of A.I.M.E., A.S.T.M., A.S.M., American Chemical Society, Society of the Chemical Industry, American Electrochemical Society, Franklin Institute, Providence Engineering Society, New England State Railway Club, Association Brass Founders of New England, and the New England Foundrymen's Association.

In Mr. Saunders' death, the industry has lost a pioneer, and the A.F.A. an outstanding member. Your Association takes this opportunity to pay tribute to Mr. Saunders' contributions.

## Nominating Committee Appointed for 1945

AT a meeting of the Executive Committee of the A.F.A. Board of Directors, held October 17 at the Hotel Statler, Cleveland, the 1945 Nominating Committee was appointed in order to select candidates for the annual elections of National Officers and Directors. The elections will be held, as in past years, during the Annual Meeting of the Association, now announced for Detroit the week of April 30-May 4.

In accordance with the revised By-Laws approved by the membership and effective July 1, 1944, the A.F.A. Chapters played a much larger part than formerly in the selection of this year's Nominating Committee. Article X, Section 1 of the By-Laws, governing the procedure of selection, states:

"On or before November 1 of each year the Executive Committee of the Board of Directors shall appoint a Nominating Committee of seven members, six of whom shall be from the list of eligible candidates submitted by the various local Chapters, and one of whom may be from the list of members residing outside Chapter territories, who, together with the last two living Past Presidents, shall constitute a Nominating Committee of nine members."

The committee appointed will consist of the following:

Past-President D. P. Forbes, Chairman, Gunite Foundries, Inc., Rockford, Ill.

Past-President L. C. Wilson, Read-

ing Steel Castings Div., American Chain & Cable Co., Reading, Pa.

W. E. Mahin, Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

Charles Morrison, Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.

Martin J. Lefler, Strom Brass Foundry, Elkhart, Ind.

R. K. Glass, Republic Steel Corp., Buffalo, N. Y.

E. Trout, Lufkin Foundry & Machine Co., Lufkin, Texas.

Henry McFarlin, The Lunkenheimer Co., Cincinnati.

John W. Porter, American Steel Foundries, East Chicago, Ind.

The Nominating Committee will meet in January, at which time it will also consider the names of any candidates suggested by individual members of the Association, as provided for in the By-Laws. Such names and recommendations may be submitted to any member of the Nominating Committee. The Committee then will place in nomination a slate of names for the election of a President and a Vice-President, each to serve one year, and five members of the Board of Directors, to serve three years.

## A.F.A. Gray Iron Division Formulates Program Plans

AT MEETING of the Gray Iron Division Program and Papers Committee was held in Hotel Statler, Cleveland, Ohio, October 19. This is the second meeting of the Program and Papers Committee, the first being held in New York at the time of the meeting of the American Society for Testing Materials, where preliminary plans were made.

The present meeting discussed concrete plans for the 1945 Convention Program, and decided on four formal sessions. Two sessions will be devoted to a symposium on gray iron casting properties, one on papers of general interest to gray iron foundrymen, and one will be a panel discussion on inoculation of gray iron, conducted by the Gray Iron Division Committee on Inoculation.

Those in charge of the various sessions to be sponsored by the Gray Iron Division are already at work, and have notified the individuals who will participate that manuscripts should be in the hands of the National Office not later than January 1, 1945.

# NEW ASSOCIATION MEMBERS

(September 16 to October 15, 1944)



\* A total of 239 new members enrolled, and one of the best showings in any single month goes into the A.F.A. record for the period just past! Twenty-four out of 27 Chapters were represented in the enrollment, with 53 names added to the Saginaw Valley roster. There seems to be no stopping this youngster, although the veterans are holding their own. Among the leaders were the Twin City Chapter, with 29 new members, and Chicago, with 20 new additions.

## Conversion from Company to Sustaining

\*International Harvester Co., Milwaukee, Wis. (E. W. Rice, Foundry Sup't.)—Wisconsin Chapter.  
†Western Alloy Steel Casting Co., Minneapolis. (C. C. Hess, Works Mgr.)—Twin-City Chapter.

## Conversion from Personal to Company

\*Prospect Foundry Co., Minneapolis. (Stanley J. Sitorz, Mgr.)—Twin-City Chapter.

## Sustaining Members

\*Climax Molybdenum Co., Canton 2, Ohio (M. M. Clark, Met. Engr.)—Canton District Chapter.  
†East Texas Electric Steel Co., Longview, Texas—Texas Chapter.

## BIRMINGHAM CHAPTER

Russell Barnwell, Sand Control, Lee Bros. Foundry Co., Anniston, Ala. C. F. Boutwell, Yard Foreman, Stockham Pipe Fittings Co., Birmingham. Elliott M. Cranford, Foreman, Brass Cores, Stockham Pipe Fittings Co., Birmingham. U. C. Garrett, Foreman, Core Room, Lee Bros. Foundry Co., Anniston, Ala.  
\*Gulf Star Foundries, Corpus Christi, Texas (Clinton E. Smith, Partner).  
R. N. Hays, Foreman, Wood Pattern Shop, Stockham Pipe Fittings Co., Birmingham.  
\*Independent Pneumatic Tool Co., Birmingham (George F. Strauss, Mgr., Birmingham Branch). L. W. Johnston, Foundry Foreman, Lee Bros. Foundry Co., Anniston, Ala. Gilbert A. Lane, Foreman, Stockham Pipe Fittings Co., Birmingham. J. P. McLendon, Dir. of Training, Stockham Pipe Fitting Co., Birmingham.  
\*Standard Oil Co. of Kentucky, Birmingham (W. F. Wilcox, Sales Engr.).  
Boyd Vaughan, Engineer, Lee Bros. Foundry Co., Anniston, Ala. Harold E. Wages, Sales Rep., Independent Pneumatic Tool Co., Birmingham.  
A. H. White, Ind. Engr. Stockham Pipe Fittings Co., Birmingham. T. Otis White, Supt. of Inspection, Stockham Pipe Fittings Co., Birmingham.

## CANTON DISTRICT CHAPTER

Edw. L. Greenman, Time Study Supv., American Steel Foundries, Alliance, Ohio.  
Fred Hoover, Treas. The Mineral City Sand Co., Mineral City, Ohio.  
Charles W. McLaughlin, The Lectromelt Steel Co., Barberton, Ohio.

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Gerald Harvey, Foreman, Perfect Circle Co., New Castle, Ind. Robert C. Norrick, Melting Supv., Perfect Circle Co., New Castle, Ind. Arthur H. Thomas, Plant Engr., National Malleable & Steel Castings Co., Indianapolis, Ind.

## CENTRAL NEW YORK CHAPTER

Harold S. Carr, Engr., Whiting Corp., Buffalo.  
John D. Mannigan, Foundry Engr., New York Air Brake Co., Watertown, N. Y.  
William F. Rose, Sales Rep., Smith Oil & Refining Co., Ramsey, N. J.

## CHESAPEAKE CHAPTER

N. C. Lecroce, Core Setter, Frick Co., Inc., Waynesboro, Pa.  
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## CHICAGO CHAPTER

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Wm. C. Biedenweg, Cost Acct. & Purch. Agent, Chicago Foundry Co., Chicago.  
George Clayton, Foundry Foreman, Industrial Pattern Works, Chicago.  
Elmer F. Fashbaugh, Asst. Met., Pettibone-Mulliken Corp., Chicago.  
Walter F. Jicha, Gen. Foreman, Calumet Steel Castings Corp., Hammond, Ind.  
Carl J. Johnson, Supt., Aluminum Foundry, Dodge Chicago Plant, Chicago.

\* Company Members.

† Sustaining Members.

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Charles Sennholz, Owner, East Side Pattern & Model Co., Chicago.  
Sidney A. Sheridan, Chicago.

Dale Sinclair, Welder, Calumet Steel Castings Corp., Hammond.  
George A. Watson, Jr., Met., Electro Metallurgical Co., Chicago.  
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David B. Joseph, Samuel Greenfield & Co., Cincinnati.  
Jacob J. Miller, Jr., Gen. Foreman, The Lunkenerheimer Co., Cincinnati.  
Harold H. Mueller, Sand Tech., Minster, Ohio.

## DETROIT CHAPTER

George C. Bergin, Sr., Asst. Supt., Core Room, Wilson Foundry & Machine Co., Pontiac, Mich.  
Elwood Cook, Production Clerk, Wilson Foundry & Machine Co., Pontiac.  
R. O. Flanders, Stevenson, Jordan & Harrison, Inc., Albion, Mich.  
Adelbert C. Good, Asst. Prof. Engineering College, Wayne University, Detroit.

Eugene V. Ivano, Met. Engr., Steel Sales Corp., Detroit Office, Detroit.  
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Theodore Miller, Purchasing Dep't., Detroit Diesel Engine Div., G. M. C., Detroit.

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Arnold W. Soper, Foundry Supt., Wilson Foundry & Machine Co., Pontiac.  
Sidney J. Tuson, Molding Line Foreman, Wilson Foundry & Machine Co., Pontiac.

Charles Vargo, Core Foreman, Wilson Foundry & Machine Co., Pontiac.

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Frank Adamouski, Melting Foreman, Dow Chemical Co., Bay City, Mich.  
James H. Bernard, Controller, Eaton Mfg. Co., Foundry Div., Vassar, Mich.

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Howard V. Grieve, Foreman, General Foundry & Mfg. Co., Flint.

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 Anthony Scherzer, Supv., Eclipse-Pioneer Foundries, Teterboro.  
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 Robert H. Simpson, Asst. to Foundry Supt., Eclipse-Pioneer Foundries, Teterboro.  
 Claude M. Walther, Asst. Supv., Pattern Shop, Eclipse-Pioneer Foundries, Teterboro.  
 Dr. J. Zimmerman, Editor-in-Chief, Daily Metal Reporter, New York City.

#### MICHIGANA CHAPTER

Francis Chapman, Foreman, Shipping Room, Strom Brass Foundry, Elkhart, Ind.  
 Kenneth R. Clark, Purchasing Agent, Strom Brass Foundry, Elkhart.  
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 Adam H. Haag, Proprietor, Elkhart Pattern Works, Elkhart.  
 Thomas L. Higgins, Supv. of Pattern Equip., Bendix Products Div., South Bend, Ind.  
 George W. Hyland, Core Room Foreman, Williams Bros., Inc., Elkhart.  
**Interstate Smelting & Refining Co., Chicago. (Samuel Fallick, Pres.).**  
 Frank Rogers, Foreman, Core Room, Oliver Farm Equipment Co., South Bend.  
 H. James Strom, Jr., Partner, Strom Brass Foundry, Elkhart.  
 Davis Taylor, Sales Engineer, American Foundry Equipment Co., Mishawaka.  
 Leo Whalen, Foreman, Furnace Room, Strom Brass Foundry, Elkhart.  
 Ralph Whalen, Foundry Foreman, Strom Brass Foundry, Elkhart.  
 George F. Wisolek, Foundry Supt., C. G. Conn, Ltd., Elkhart.

#### NORTHEASTERN OHIO CHAPTER

**\*Great Lakes Pattern Co., Cleveland. (William F. Bock, Pres.).**  
 Dewey C. Harvey, Sales Engr., Osborn Mfg. Co., Cleveland.  
 William N. Jonas, Great Lakes Pattern Co., Cleveland.  
 Earl Martinson, Foreman, Aluminum Co. of America, Cleveland.  
 Jerry S. Mercer, Met., Aluminum Co. of America, Cleveland.  
 I. Michael Novosel, Core Room Foreman, Lake City Malleable Co., Ashtabula, Ohio.  
 Thomas O'Brue, The National Smelting Co., Cleveland.  
 John N. Schweitzer, Met. Eng., Aluminum Co. of America, Cleveland.

#### NORTHERN CALIFORNIA CHAPTER

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**\*Heaps Engineering (1940) Ltd., New Westminster, B. C., Canada (C. G. Hutton, Asst. to Pres.).**  
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 Neal E. Russell, Chief Scheduler, Defense Plant Foundry, Columbia Steel Co., Pittsburgh, Calif.  
 Roy C. Wendelbo, Management Supt., De Sanno Foundry & Machine Co., Oakland, Calif.

#### ONTARIO CHAPTER

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 A. R. Kennedy, Foundry Supt., Davenport Works, Canadian General Electric Co., Ltd., Toronto, Ontario.  
 Reg. M. Littlejohn, Salesman, Wm. R. Barnes Co., Ltd., Hamilton.  
**\*Standard Metal Co., Brantford, Ontario (Gavin B. Young).**  
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#### PHILADELPHIA CHAPTER

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#### ROCHESTER CHAPTER

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 Lloyd E. Toong, Wood Pattern Maker, Symington-Gould Corp., Rochester.

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 Arthur F. O'Hare, Central Brass & Aluminum Foundry, St. Louis.  
**\*E. J. Somers Foundry Co., Belleville, Ill. (E. J. Somers, President).**

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 Andrew R. Barr, Instructor, Civil Service, Pasadena, Calif.  
 Edgar L. Butts, Permanent Model Engr., Aluminum Co. of America (Vernon Plant), Vernon, Calif.  
 John Francis Drake, Partner, Kennard and Drake, Los Angeles.  
 Joe J. Fisher, Laboratory Dir., Aircraft X-Ray Laboratories, Huntington Park, Calif.  
 Homer E. Kaufman, Met. Engr., Apex Steel Corp., Los Angeles.  
 J. E. Pauley, Kinney Aluminum Co., Los Angeles  
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 Alex Ross, Office Mgr., Westelectric Castings, Inc., Los Angeles.  
 Robert Staley, Westelectric Castings, Inc., Los Angeles.  
 Floyd L. Teel, Advance Aluminum & Brass Co., Los Angeles.  
**\*Zells & Howell Foundry, Los Angeles (C. L. Zells, Partner).**

#### TEXAS CHAPTER

Arthur H. Smith, Supt., Aircraft Foundry Pattern Co., Grand Prairie, Texas.

#### TWIN-CITY CHAPTER

Carmen Alphonse, Diamond Iron Works, Minneapolis.  
 La Vern Anderson, Core Maker, Progress Pattern Foundry Co., St. Paul.  
 Franklin A. Austin, Engr., Crown Iron Works, Minneapolis.  
 Martin Cirhan, Technician, Progress Pattern & Foundry Co., St. Paul.  
 Melbourne Dahl, Engr., Progress Pattern & Foundry Co., St. Paul.  
 Fred Dick, Foundry Foreman, Union Brass & Metal Mfg. Co., St. Paul.  
 Clifford Englund, Pattern Supt., Central Machine Works Co., Minneapolis.  
 Roland Erbst, Foundry Supt., Midway Iron Works, St. Paul.  
 Abel Falconer, Foundry Foreman, Marrin Foundry, Inc., Minneapolis.  
 R. R. Fisher, Foundry Supt., St. Paul Eng. & Mfg. Co., St. Paul.  
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 Donald J. McLean, Cleaning, Progress Pattern & Foundry Co., St. Paul.  
 George W. Nelson, Foundry Supt., Central Machine Works, Minneapolis.  
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O. P. Nelson, Foundry Supt., Crown Iron Works, Minneapolis.  
 Oscar A. Nelson, Asst. Foundry Supt., Central Machine Works Co., Minneapolis.  
 Henry N. Peterson, Foundry Foreman, Paul Pufahl & Son Foundry, Minneapolis.  
 Douglas Reid, Foundry Foreman, Diamond Iron Works, Minneapolis.  
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 Walter F. Sexton, Office Manager, Prospect Foundry, Minneapolis.  
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#### WESTERN NEW YORK CHAPTER

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 Z. Ted Ponatoski, Master Mechanic, Otis Elevator Co., Buffalo.  
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#### WISCONSIN CHAPTER

**\*Badger Fire Brick & Supply Co., Milwaukee, Wis. (C. L. Tanner, President).**  
 Nathan T. Garber, Met., Kearney & Trecker, Milwaukee.  
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 Walter A. Janke, Chief Chemist, Nordberg Mfg. Co., Milwaukee.  
 George Oftedal, New Products Dev., Allis-Chalmers Mfg. Co., West Allis, Wis.  
 George J. Ott, Foreman, Nordberg Mfg. Co., Milwaukee.  
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 Max Raeber, Pattern Shop Foreman, Allis-Chalmers Mfg. Co., West Allis.  
 James M. Savage, Abrasive Engr., Bay State Abrasive Products Co., Milwaukee.  
**\*Thiem Products Co., Milwaukee (Dorold W. Thiem).**

#### OUTSIDE OF CHAPTER

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 Walter E. Scott, Foundry Mgr., E F G Engineering Works, Pueblo, Colo.  
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 K. E. Wedell, Chief Patternmaker, U. S. Navy.

# REVISED SPECIFICATIONS

## Approved at A.S.T.M. Annual Meeting

REVISIONS in several castings specifications were approved by the American Society for Testing Materials at its 47th Annual Meeting held in New York, June 26-30, 1944. Other specifications were accepted as tentative standards, or adopted or withdrawn as standards.

The following list gives the castings specifications which were revised:

### Tentative Standard Specifications

- A 216-42T—Specifications for Carbon-Steel Castings Suitable for Fusion Welding for Service at Temperatures up to 850 F.
- A 217-42T—Specifications for Alloy-Steel Castings Suitable for Fusion Welding for Service at Temperatures from 750 to 1100 F.
- A 220-39T—Specifications for Pearlitic Malleable Iron Castings.
- A 47-33T—Specifications for Malleable Iron Castings.
- A 197-39T—Specifications for Cupola Malleable Iron.
- B 22-42T—Specifications for Bronze Castings for Turntables and Movable Bridges and for Bearing and Expansion Plates of Fixed Bridges.
- B 30-42T—Specifications for Copper-Base Alloys in Ingot Form for Sand Castings.
- B 132-41T—Specifications for Leaded High-Strength Yellow Brass (Manganese Bronze) Sand Castings.
- B 143-42T—Specifications for Tin-Bronze and Leaded Tin-Bronze Sand Castings.
- B 144-42T—Specifications for High-Leaded Tin-Bronze Sand Castings.
- B 145-42T—Specifications for Lead Red Brass and Leaded Semi Red Brass Sand Castings.
- B 146-42T—Specifications for Lead Yellow Brass Sand Castings for General Purposes.
- B 147-42T—Specifications for High-Strength Yellow Brass and High-Strength Leaded Yellow Brass Sand Castings.
- B 148-42T—Specifications for Aluminum Bronze Sand Castings.
- B 149-42T—Specifications for Lead Nickel-Brass and Nickel-Bronze Sand Castings.

B 26-43T—Specifications for Aluminum-Base Alloy Sand Castings.

B 80-41T—Specifications for Magnesium-Base Alloy Sand Castings.

B 93-41T—Specifications for Magnesium-Base Alloys in Ingot Form for Sand Castings and Die Castings.

B 108-43T—Specifications for Aluminum-Base Alloy Permanent Mold Castings.

B 94-40T—Specifications for Magnesium-Base Alloy Die Castings.

### Standard Specifications

A 27-42—Specifications for Carbon-Steel Castings for Miscellaneous Industrial Uses.

A 87-42—Specifications for Carbon-Steel and Alloy-Steel Castings for Railroads.

A 95-41—Specifications for Carbon-Steel Castings for Valves, Flanges, and Fittings for High-Temperature Service.

A 148-42—Specifications for Alloy-Steel Castings for Structural Purposes.

A 157-42—Specifications for Alloy-Steel Castings for Valves, Flanges, and Fittings for Service at Temperatures from 750 to 1100 F.

A 215-41—Specifications for Carbon-Steel Castings Suitable for Fusion Welding for Miscellaneous Industrial Uses.

B 61-42—Specifications for Steam or Valve Bronze Castings.

B 62-41—Specifications for Composition Brass or Ounce Metal Castings.

B 85-42—Specifications for Aluminum-Base Alloy Die Castings.

Standard Specifications for Castings of the Alloy: Copper 88 per cent, Tin 8 per cent, Zinc 4 per cent (B 60-41) was withdrawn.

Specifications for Chromium-Nickel-Iron Alloy Castings for High Temperature Service was accepted as a tentative standard.

Specifications for Aluminum Ingots for Remelting (B 24-41T) and Specifications for Lead- and Tin-Base Alloy Die-Castings (B 102-39T) were adopted as standards.

### Standard Number of Rams For Sand Test Specimens

By H. Ries

IN the A.F.A. Handbook on Testing Sands and Clays, the standard method for preparing the sand specimen states that it shall be given three rams.

Attention, however, has been called to the fact that in some foundries the sand in the mold is rammed to a harder condition than it would get if given three rams in the testing apparatus. Some steel foundries use 10 rams, and this might be called a shop method.

In such cases it would seem that there would be no objection if the sand were given the extra rams in order to get the proper correlation between laboratory and foundry conditions but, if the results of such tests are published, the number of rams should be stated.

For comparison with other foundries or checks between producer and consumer, the standard method of three rams should be used.

### Michigan U. to Study Cast Iron Machinability

AN extensive investigation of the machining qualities of cast iron is now under way at the University of Michigan, Ann Arbor, Mich. The project is under the direction of Professor O. W. Boston, chairman, Department of Metal Processing, College of Engineering. Professor Boston is interested in securing a large number of gray iron test bars preferably of the dimensions 2x4x12 in.

Your Association has been requested by Professor Boston to notify its members of this work in which they will have considerable interest, and to ask their cooperation in supplying him with the desired bars.

Those companies which are interested in participating in the test should give full information regarding the physical properties of the iron from which the bars were made, because the information obtained on the machining qualities will be based on the A.S.T.M. specifications classifying cast iron as to strength. Test bars submitted should be of the highest possible quality, and immune from defects.

# CHAPTER OFFICERS



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Milwaukee  
Vice-Chairman  
Wisconsin Chapter



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# CHAPTER ACTIVITIES

## News

See page 30 for list of Chapter representatives whose reports of local activities appear in this issue.

### TWO NATIONAL OFFICERS Address Opening Session at Ontario

By G. L. White

FOLLOWING a custom established in recent years, the opening meeting of Ontario Chapter, at the Royal Connaught Hotel, Hamilton, September 29, was devoted to the personnel problems of the foundry industry, particularly to the methods that must be adopted to secure suitable new workers in the foundry.

Chapter Chairman, R. T. Robertson, International Harvester Co. of Canada, Ltd., presided, with D. O. Davis, Dominion Foundries and Steel, Ltd., serving as Chairman of the three addresses.

Introducing the subject, Joseph Sully, Sully Brass Foundry, Ltd., and National A.F.A. Director, spoke on "Looking Ahead in the Foundry Industry." He was followed by H.

Mabson, Industrial Accident Prevention Association, who discussed "Safety as a Factor in the Foundry Labor Problem." The final speaker in this interesting forum was F. J. Walls, International Nickel Co., Detroit, Vice-President of A.F.A., who talked on "Foundrymen for the Future."

Mr. Sully made a special plea for better co-operation between labor and management. He also discussed briefly factors of cost, sales and plant conditions that enter into the labor management picture.

Mr. Mabson referred to the unfortunate but general impression that the foundry is a dirty, hard, unhealthy place in which to work, where little attention is paid to safety. He emphasized the steps

that could be taken readily in every plant to improve housekeeping and referred to the Safety Code of A.F.A. as an excellent guide. The major part of his address was concerned with silicosis, which is providing a background for the idea that the foundry is unhealthy.

Mr. Walls emphasized the need of the foundry industry for a greatly improved program of public relations and education of management and employees. He indicated that better public understanding of the foundry industry might be developed through talks before groups, motion pictures, literature for general distribution, and trips through foundries. For the development of prospective foundrymen, it is necessary to secure the inclusion of foundry work in manual training, in the teaching of trade schools and a further step in the development of foundry practice as a hobby for youth groups.

Within the foundry, executive and supervisory staffs must be taught the necessity for better human relations. At the same time, the position of the foundry may be strengthened by improvement of working conditions through better light, air, shower rooms, dining rooms, etc.

Comparative rates of pay for various jobs in foundry should be studied and where necessary modified.

In conclusion, Mr. Walls pointed out that the progress which could be made would depend largely upon the efforts of those in charge of foundry operations.



Two hundred members and guests met in Frankenmuth, Mich., October 5, when the new Saginaw Valley Section, Detroit Chapter, held its first meeting of the current season.

### "Centrifugal Castings" Is Quad City Subject By H. L. Creps

CHAPTER Chairman R. E. Wilke, Deere & Co., Moline, Ill., presided at the October 16

meeting, at the Armstrong Hotel, Rock Island, Ill., when 71 members of the Quad City Chapter met to hear John Perkins, Ford Motor Co. of Canada, discuss "Centrifugal Castings."

Mr. Perkins explained the many experiments and processes tried in the Ford foundry since the first centrifugal castings were poured in 1939. At present the company is pouring several thousand tons of centrifugally cast steel parts monthly. He described the dry sand, green sand and die mold methods, and stated that a high percentage of their tonnage is being poured by the die mold method. In pouring steel castings, they have found it best to use the lowest possible pouring temperature, in their case 2830° F.

The speaker pointed out the tremendous increase in yield made possible by the centrifugal process. For instance, a 60 lb. finished part which formerly required a 280-lb. rough steel forging is now machined from a rough centrifugal casting weighing only 80 lb.

The close tolerances possible through the centrifugal process and the enormous increase in physical characteristics are added advantages, according to Mr. Perkins. An interesting discussion period covering both the ferrous and non-ferrous metals concluded the meeting.

## 1944-45 Season Begins for Central New York

By John Feola

EIGHTY members and guests were present at the first meeting of the season for the Central New York Chapter, held October 13 at the Onondaga Hotel, Syracuse, N. Y.

The speaker of the evening was R. G. McElwee, Vanadium Corporation of America, who discussed "Gray Iron." Mr. McElwee pointed out that for years foundrymen have been concentrating on tensile strength as the major physical property of gray iron. This idea was so firmly entrenched that designers specified 30 Iron, 40 Iron, etc., meaning that 30 Iron was iron which has a tensile strength of 30,000 lb. psi.

In recent years both the designer and the foundryman have recognized the other physical properties



National Officers' Night is always important to the Chesapeake Chapter, and this year was no exception, as indicated by the nice turnout at the September 22 meeting at the Engineers' Club, Baltimore.

of cast iron that are more important than tensile strength in castings for particular uses. These properties are especially prominent in the so-called alloy or inoculated irons.

The speaker also pointed out that tests have proved that iron of the same carbon equivalent could be made, using higher carbon and lower silicon than that commonly used. This type iron, the speaker said, will appreciably reduce casting difficulties in the foundry.

## No. Illinois-So. Wisconsin Hold Meeting in Beloit

By H. W. Miner

THE October 10 meeting of the Northern Illinois and Southern Wisconsin Chapter was held at Hotel Hilton, Beloit, Wis. The speaker of the evening was W. B. George, R. Lavins & Sons, Chicago.

Mr. George stressed the importance of cost figures in the non-ferrous foundries for the postwar era. Any such figures should include the hazard of the job to be accurate, and generally this is not considered. He also explained the factors affecting melting costs, such as design of

furnaces, proper fuel usage, crucible life and melting time.

The speaker presented numerous illustrations of proper and improper gating of brasses and bronzes. In any problem related to proper gating, Mr. George pointed out, it is essential to consider the five types of shrinkage: liquid, volume, dendritic, linear, and diametral. It is also necessary to obtain directional solidification.

Many samples were distributed to illustrate defects and other points of the talk. A lengthy discussion followed.

## Frank T. Chestnut Is Speaker at NEO

By Pat Dwyer

AT the October 12 meeting, held in the Cleveland Club, approximately 125 members and guests of the Northeastern Ohio Chapter heard a highly interesting discussion of the world of sport by Ed Bang, Sports Editor, "The Cleveland News," and an equally interesting and technical discussion on the subject of "Induction Melting Furnaces" by Frank T. Chestnut, Ajax



Random "shots" at the Canton District Farm Picnic.

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**Electrothermic Corp., Trenton, N. J.**

Following a brief historical description of the origin and development of the induction type melting furnace, illustrated by slides showing construction and characteristic features, Mr. Chestnut pointed out that only two types have been continuously successful. His subsequent discussion was confined to these two, the submerged resistor furnace and the high frequency furnace.

The speaker presented a comparison of advantages and disadvantages of the two types, including cost of operation on various types of metal. He claimed that the high frequency furnace combines substantially all the qualities of the submerged resistor furnace, and has many additional advantages. Except for first cost and slightly lower efficiency these factors would make it the ideal furnace for almost all metal melting.

In summarizing his paper, Mr. Chestnut said that an electric furnace is justified where the metal to be melted is of a fussy analysis, and where the quality must be kept high. Choice of a furnace is determined by the economics of a particular set of conditions, including the stand-by charge for power, volume of metal to be melted, length of the working day, type of metal, life of involved refractories, cost of labor and the willingness of labor to work under different foundry conditions.

### **Canton District Group Enjoys Farm Picnic**

By Geo. M. Biggert

ON September 16, all the Canton District members were the guests of the Chapter Treasurer, Ottis D. Clay, Tuscora Foundry Sand Co., at his farm home near Canal Fulton, Ohio.

Just an old-fashioned farm picnic was what the boys wanted, and this nearly 100 members enjoyed. Baseball, horseshoe pitching, volley ball, cards, croquet and antique guessing were on the program. Buffet style supper was supplied from 6 until 8 o'clock, with a conveniently located refreshment bar.

The main feature of the afternoon was the presentation of a meeting bell, gavel and box, made by the employees of Pitcairn Co., Barberston, Ohio, as a gift to the Canton

District Chapter. The presentation on behalf of the Pitcairn Co. was made by Gus Mattle, and it was accepted by K. F. Schmidt, United Engineering & Foundry Co., Canton, Chapter Chairman.

### **Chicago Subject Is "Employee Relations"**

By L. C. Smith

**J. D. GRUENER,** International Harvester Co., Chicago, gave the 175 members and guests of the Chicago Chapter some post-war ideas, when he spoke at the October 2 meeting at the Chicago Bar Association Restaurant.

Mr. Gruener discussed the ways in which his company bolsters the morale of the 18,000 employees now in the armed forces. Principally there are the company circulars which keep servicemen advised of the activities of their former co-workers. Mr. Gruener also explained that returning veterans would enjoy their pre-war personnel ratings.

### **Discuss Manpower Problem At Eastern Canada**

By G. Ewing Tait

**E**ASTERN Canada and Newfoundland Chapter's activities got away to a flying start on the evening of September 22. The speaker was Joseph Sully, Sully Brass Foundry Co., Ltd., Toronto, a National Director of A.F.A. He opened his talk by extending greetings from the National Office to all members in both English and French and briefly outlined the aims and services of the Association.

In discussing "Romance in the Foundry Industry," Mr. Sully pointed out that the romance and interest lay in the wide variety of problems there were to be solved.

According to the speaker, the greatest problem today is the relationship between capital, labor and management. Capital furnishes the plant and equipment; labor the skill and actual work in producing the finished product, and management supplies the direction, technical, engineering and sales ability to bring these two together to make the finished product, and then merchandise it. Each depends on the other and there can be no new world



The camera man at Southern California's 7th Annual Stag sent out an S-O-S, and quite a number of the 500 members and guests posed for this group picture which, because of its size, had to be split into two parts. The right "flank" is shown at the bottom of this page.

order unless all function in unison.

A major handicap in the industry today is the shortage of skilled men. Mr. Sully urged that all foundries make efforts to attract more men to the trade by improving working conditions and plant facilities and keep them interested by personal contact. He complimented the Chapter on the work of its Educational Committee along these lines.

Dealing with the technical problems in the manufacture of castings such as the sand, metal, gates and risers, Mr. Sully outlined the work of the American Foundrymen's Association. He pointed out how knowledge is pooled through the Association and published for the benefit of all members.

Foundrymen were urged to take pride in their work, to ensure that its quality was up to standard and sold at a fair price. A number of factors entering into the cost of a casting, and which are sometimes overlooked, were mentioned. The actual costs of castings must be known in order to set prices intelligently.

Mr. Sully concluded by pointing out that the brighter days which lie ahead will depend on the extent to which we can be content with a reasonable portion of this world's goods and a just amount of happiness. This can only come through a willingness to work together.

It was announced that the Chap-

ter is sponsoring the evening courses in Molding and Patternmaking at the Montreal Technical School this year. Enrollment is expected to exceed the capacity of 24 in each class. In outlining the work of the Educational Committee, H. Louette, the Committee Chairman, told of the plans being made to show various foundries to high school boys with a view to encouraging them to enter the trade upon graduation.

### Saginaw Valley Group Already Has 225 Members

By Jos. J. Clark

THE newly organized Saginaw Valley Group of the Detroit Chapter of the A.F.A. held its first regular dinner meeting of the season October 5, at Frankenmuth, Mich.

Approximately 200 members and guests from Saginaw, Flint, Bay City, Lansing, Midland, Vassar, Owosso, Lapeer and Albion were present. On hand for the opener were: F. J. Walls, International Nickel Co., Detroit, and National Vice-President, and R. G. McElwee, Vanadium Corp. of America, Chairman of the Detroit Chapter.

Principal speaker of the evening was H. W. Dietert, Harry W. Dietert Co., Detroit, whose topic was "Mold Atmosphere Control." Colored motion pictures and slides were

used to portray the action of various atmospheres and various facing materials upon the sand and casting in a mold. Interest in the subject was evidenced by a lively discussion.

The Saginaw Valley Group now has a membership of 225 and applications are coming in regularly. With this membership already established and such an enthusiastic first meeting, this first chapter section is assured of a successful season. The group extends a cordial invitation to A.F.A. members of other Chapters, to attend its meetings when in the Saginaw Valley vicinity.

### Western New York Reports on Two Events

By J. Ralph Turner

THERE is a friendly controversy among the Western New York members and guests. Some say the baseball game featured at the Victory Outing, held September 16 at Sturm's Grove, was won by the foundrymen, while others contend the vendors triumphed. Be that as it may, the 360 who attended this annual outing were unanimous in declaring that the event was a huge success.

#### October 6 Meeting

A more serious attitude prevailed at the regular October meeting held at Hotel Touraine, Buffalo, when



F. G. Sefing, International Nickel Co., New York, discussed "Where Can Education Be Used in the Foundry?"

Mr. Sefing said that, since the foundry industry is to make castings in competition with other fabricated products, castings must be better or cheaper than competitive items. Constant improvement of castings and the methods of production are essential for them to remain in a competitive position.

Such improvement is accomplished by better education of the workers, foremen and management. Sciences already accepted in the foundry include chemical analysis, pyrometer reading and mechanical equipment. Other sciences which are developing rapidly include sand control, alloy castings, microstructure studies and specifications.

Future developments in the foundry include the regular manufacture of absolutely sound, clean castings, with improved design for economic production and complete understanding of the end use of the



(Photos courtesy John Bing, A. P. Green Fire Brick Co.)

Some of the personalities attending the opening meeting of the Wisconsin Chapter, held at the Schroeder Hotel, Milwaukee, in September.

casting. The merchandising feature in the sale of castings should be developed by producing clean, smooth, painted castings which have distinct eye appeal to the customer.

In referring to the men of the foundry industry, Mr. Sefing pointed out that the workers of the past were artisans, and production of castings was mainly handled without any

far-reaching plans. The workers of today are increasing their understanding of what they are doing, and why they are doing it, as evidenced in the improved quality of castings. Management must understand the human element problems and endeavor to place the right man in the right job, all toward the end of being in a better position to compete with materials produced outside the foundry industry.

The speaker further stated that the educational program should include a vigorous campaign to induce young men to enter the foundry field.



"Trends in Employee Relations" was the subject that brought this fine turnout to the Chicago Bar Association Restaurant for the Chicago Chapter's October 2 meeting.

## Rochester Chapter Gives a Clam Bake

By D. E. Webster

ROCHESTER Chapter's first clam bake, held at the Point Pleasant Hotel, September 16, was such a success that a "return performance" is being demanded by the 180 members and guests who attended.

Included on the guest list were Samuel Dicker, Mayor of Rochester; Frank Van Lare, Vice-Mayor, and Albert Skinner, Monroe County Sheriff, and a number of friends from Batavia, Painted Post and Fulton, N. Y.

Arrangements for the event were under the direction of the entertainment committee, headed by Irving Rosenthal, Rochester Smelting and Refining Co. Fred Weismuller directed the sports program which included speed boat rides around picturesque Irondequoit Bay.

AMERICAN FOUNDRYMAN

## National Officers' Night Held at Chesapeake Meet

By E. J. Hubbard

TWO National Officers — President R. J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich., and Director J. E. Crown, U. S. Navy Yard, Washington, D. C. — were scheduled to appear on the program at the Chesapeake Chapter's September 22 meeting, at the Engineers Club, Baltimore.

When it was found that pressing business made it impossible for President Teetor to keep the engagement, Robert E. Kennedy, National Secretary, acted in his place and extended Mr. Teetor's greetings to the group. The President's message was presented by E. H. Horlebein, Gibson & Kirk Co., Baltimore, a present chapter director and past chairman.

Chairman H. A. Horner, Frick Co., Inc., Waynesboro, Pa., then introduced the Chapter's officers and board of directors, and presented John Robb, Jr., Hickman, Williams & Co., Philadelphia, Secretary-Treasurer of the Philadelphia Chapter, who brought greetings from his group.

A film, "Use of Gypsum for Pattern Making," was shown through the courtesy of the U. S. Gypsum Co., after which a discussion period was conducted by Vice-Chairman Howard Taylor, Naval Research Laboratory, and Melvin Young, Glen L. Martin Co.



Feminine charm received an early call by the Cincinnati Chapter, for Ladies' Night was among the first meetings on the 1944-45 calendar of events.

## Sand Study Is Subject • At St. Louis Meeting

By C. E. Rothweiler

EIGHTY members and guests attended the October 12 meeting of the St. Louis Chapter to hear a discussion of "Dilatometer Study on Sands."

The speakers of the evening were: Henry Meyer, General Steel Castings Corp., Granite City, Ill., and Gene Conreaux, American Steel Foundries, Granite City.

Mr. Meyer, in his talk which dealt with molding sands, said that at his plant the castings range in size from 100 lb. up to 120,000 lb., the average size being approximately

15,000 lb. His discussion concerned the comparative value of Ottawa Silica Sands with Missouri Silica Sands and the reaction of these sands after adding bentonite and cereal binders.

The important facts brought out in Mr. Conreaux's discussion on core sand were: variation of hot strength throughout a 12-min. soaking period at 2,500° F.; maximum hot strength of core sand mixes when used at various high temperatures; effect of moisture-baking time and temperature on maximum hot strength at 2,000° F. and 2,500° F.; effect of increased moisture and its influence on required baking time and temperature to obtain maximum hot strength; effect of baking time and



The boys at Birmingham evidently like those famous Southern barbecues, because approximately 450 members and guests met at the Roebuck Club for the 11th Annual Outing. A diversified sports program was headed by a baseball "classic" between the Foundrymen Giant Killers and the Supplymen Giants.

temperature on gas content when tested at 1,800° F.; and effect of Mogul corn flour on hot strength.

Both speakers took part in the lively question and answer period which followed.

## 450 Attend Barbecue Given by Birmingham

By J. P. McClendon

THE 450 members and guests who attended the Birmingham Chapter's 11th Annual Outing at the Roebuck Club, will remember the event as one of the most enjoyable outings ever sponsored by the group.

Credit for a fine program goes to T. H. Benners, Woodward Iron Co., Chairman of the entertainment committee, and his staff of assistants: Gale R. Irvin, Republic Steel Corp.; R. L. Ogden, American Casting Co.; Eugene Whelchel, American Cast Iron Pipe Co.; and Harry Mouat, Whiting Corp.

A hotly contested softball game highlighted the diversified sports program, with Captain Harry Mouat and his "Supplymen Giants" defeating the "Foundrymen Giant Killers," piloted by Gene Whelchel.

## Reports on Chapter Activities

Officers and representatives of A.F.A. chapter and other foundry groups who report on local activities in this issue, are identified below:

*Birmingham*—J. P. McClendon, Stockham Pipe Fittings Co., Birmingham; Chapter Reporter.

*Canton District*—Geo. M. Biggett, United Engineering & Foundry Co., Canton, Ohio; Chapter Reporter.

*Central New York*—John Feola, Crouse-Hinds Co., Syracuse, N. Y.; Chapter Reporter.

*Chesapeake*—E. J. Hubbard, Koppers Co., Baltimore, Md.; Chapter Reporter.

*Chicago*—L. C. Smith, Peninsular Grinding Wheel Co., Chicago; Chapter Reporter.

*Cincinnati*—Jos. Schumacher, Hill & Griffith Co., Cincinnati; Chapter Secretary.

*Eastern Canada and Newfoundland*—E. Ewing Tait, Dominion Engineering Works, Lachine, Que.; Chapter Vice-Chairman.

*Northeastern Ohio*—Pat Dwyer, THE FOUNDRY, Cleveland; Chapter Reporter.

*No. Illinois-So. Wisconsin*—H. W. Miner, Fairbanks, Morse & Co., Beloit, Wis.; Chapter Secretary.

*Ontario*—G. L. White, Westman Publications, Ltd., Toronto; Chapter Secretary-Treasurer.

*Quad City*—H. L. Creps, Frank Foundries Corp., Moline, Ill.; Chapter Secretary-Treasurer.

*Rochester*—D. E. Webster, American Laundry Machinery Co., Rochester, N. Y.; Chapter Secretary-Treasurer.

*Saginaw Valley*—J. J. Clark, Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.; Chapter Reporter.

*St. Louis*—C. E. Rothweiler, Hickman, Williams & Co., St. Louis; Chapter Secretary-Treasurer.

*Western New York*—J. Ralph Turner, Queen City Sand & Supply Co., Buffalo; Chapter Secretary.

## Use of Bonding Clays Discussed at Cincinnati

By J. Schumacher

"PROPER Selection and Use of Bonding Clays in Small Foundries" was the subject discussed by N. A. Dunbeck, Eastern Clay Products Co., Eifort, Ohio, at the October 9 meeting sponsored by the Cincinnati group at the Engineering Club of Cincinnati.

Mr. Dunbeck described the various types of clays and bentonites that are available. He discussed the geographical formations, how and where they occur, methods of mining and preparation for the market.

Next he discussed how clay bonds should be used in the foundry, not only covering the methods to be adopted in larger foundries, wherein sand handling systems are available, but he also discussed the intermediate steps down to the foundry using ordinary shoveling methods for mixing.



Not only the attendance, but the participation in all the games and events as well, reached new heights at the annual picnic of the Ontario Chapter, held at "Barnesdale" on August 26.

# Abstracts

NOTE: The following references to articles dealing with the many phases of the foundry industry, have been prepared by the staff of *American Foundryman*, from current technical and trade publications.

When copies of the complete articles are desired, photostat copies may be obtained from the Engineering Societies Library, 29 W. 39th Street, New York, N. Y.



## Alloys

CRYSTAL STRUCTURES. "Modern Views on Alloys and Their Possible Application," W. Hume-Rothery, Extract from THE JOURNAL OF THE INSTITUTE OF METALS, London, 1944, vol. 70, pp. 229-300.

The metals lying between potassium and copper in the Table of the Elements are considered, with special reference to the crystal structures, interatomic distances, and melting points. The general indication is that the cohesion rises to a maximum in the region of Groups VI and VII, and the interpretation of this in terms of the electron theory of Pauling is discussed. The general effect of size-factor and electron concentration on the formation of solid solutions is described, leading to Jones's theory of the alpha-beta-brass equilibrium. This theory at present applies only in the absence of lattice distortion, and it is shown that two kinds of lattice distortion have to be considered, one due to the valency electrons, and the other to the electron clouds of the ions. The effect of this on the solubilities of some elements in solid copper is indicated. Characteristics of the theory of magnesium alloys and aluminum alloys are also discussed.

## Aluminum

AS CAST. "Strong Cast Aluminum Alloy Requiring No Heat Treatment," Albert J. Matter, METALS AND ALLOYS, September, 1944, vol. 20, no. 3, pp. 643-644.

The author gives the properties of an aluminum alloy which develops high strength properties without heat treatment. The composition of the alloy is not given.

FURNACE REFRactories. (See Refractories.)

## Brass and Bronze

NICKEL BRONZE. "Nickel Bronze Castings," Ely Portman, METALS AND ALLOYS, September, 1944, vol. 20, no. 3, pp. 620-624.

The author describes a suitable foundry practice for the production of nickel bronze castings. The nickel bronze alloy was developed as a substitute for silicon bronze when the supply of copper became scarce.

## Bearings

BABBITT CAST-IRON-BACKED. (See Tinning.)

## Cast Iron

STEEL SCRAP. "Steel Mixes and Inoculants in Grey Cast Iron," W. Barnes and C. W. Hicks, FOUNDRY TRADE JOURNAL, August 10, 1944, vol. 73, no. 1460, pp. 287-292; August 17, 1944, vol. 73, no. 1461, pp. 313-319; August 24, 1944, vol. 73, no. 1462, pp. 337-341.

The authors conducted experiments to determine the effect of various amounts of steel in the metal mixture for gray iron castings. From these experiments they drew the following conclusions: increasing amounts of steel increase the tensile and transverse strengths, increase the stability of the carbides, make them amenable to low-temperature tempering, and improve internal soundness.

The use of refined irons to obtain similar results in an expensive practice.

Although nickel seems to refine the graphite in low steel mixtures, it has little effect on the higher steel mixtures.

Silicon inoculants act as deoxidizers and, up to optimum amounts, improve the metal properties. Greater amounts cause the properties to deteriorate. Aluminum inoculants have a greater scavenging effect than silicon inoculants.

Irons with large amounts of steel in the charges can be melted in any ordinary cupola.

## Casting Methods

PRECISION CASTING. "Industrial Precision Castings by a Manufacturing Jeweler," J. Albin, THE IRON AGE, September 7, 1944, vol. 154, no. 10, pp. 73-77.

A pictorial article describing the precision castings made by a former manufacturer of jewelry. Castings are made by the lost wax process, using a wax pattern in a plaster-of-paris and silica mold, evaporating the wax from the mold cavity, and filling the cavity in a centrifugal casting machine.

## Centrifugal Casting

EFFECTS ON PROPERTIES. "The Influence of Centrifugal Casting (Horizontal Axis) Upon the Structure and Properties of Metals," L. Northcott and V. Dickin, Extract from THE JOURNAL

OF THE INSTITUTE OF METALS, London, 1944, vol. 70, pp. 301-348.

Thick cylinders of three alloys, aluminum-6 per cent copper alloy, 6 per cent tin bronze, and 70:30 brass, were cast in a horizontal-axis centrifugal-casting machine, using chill molds without a central core.

The casting conditions were varied in respect of mold speed, casting temperature, rate of pour, and mold temperature, and the castings were examined to determine the influence of these factors upon structure. Small stationary ingots were prepared at the same time for comparison. The crystal size of the centrifugal castings was very much smaller than that in the stationary ones and was less susceptible to changes in casting conditions. In the centrifugal castings, small crystal size was favored by a low casting temperature and mold temperature, a high mold speed, and a slow rate of pour.

There was found to be an optimum speed of rotation of the mold which gave a uniform structure free from pronounced segregation. At much lower speeds the delay in pick-up of the molten metal in the mold resulted in splashing of the metal, which gave rise to coarse circumferential zoning and roughness of the cylinder bore. High mold speeds led to a finer structure, but this was liable to be marred by circumferential rings of segregate associated with mold vibration. The damaging effect of vibration has been confirmed by tests on vibrated unrotated ingots.

Chemical analyses showed little variation in average composition of samples taken radially from castings of 70:30 brass, but the aluminum-copper alloy and the bronze castings showed inverse segregation, the outer portions of the castings being rich in copper and tin respectively. Solidification of these thick cylinders proceeded in general from the outside towards the inside, the bore position being that where solidification finally occurred; examples of irregular solidification were, however, observed.

## Die Casting

METALLURGY. "Foundry Metallurgy of Die Casting," James L. Erickson, THE FOUNDRY, September, 1944, vol. 72, no. 9, pp. 192, 194, 196.

In order to duplicate results in any two die castings, the conditions under which those two castings are made must be identical. The author discusses at length exactly what is meant by identical conditions, pointing out the need for setting limits within which results may be duplicated. Among the factors which he discusses are chemical composition, presence of dissolved gases, fluxes and degassers, metal temperature in the pot and retention time, and speed of melting.

## Electronics

METALLOGRAPHIC APPLICATIONS. "The Electron Microscope for Metals," Robert G. Picard and Perry C. Smith, METALS AND ALLOYS, September, 1944, vol. 20, no. 3, pp. 636-641.

The electron microscope is an instrument capable of exploring submicroscopic detail. Its components may be compared to those of the optical microscope, but electrons, rather than light rays, are used to illuminate the specimen. The use of electrons makes it possible to resolve much smaller detail, since the wave length of light limits its resolving ability. Among the applications which have been developed are the metallographic study of metal surfaces and diffraction studies.

## Furnaces

ELECTRODES. "Getting the Most Out of Electric Steel Furnace Electrodes," R. L. Baldwin, METALS AND ALLOYS, vol. 20, no. 1, July, 1944, pp. 62-67.

Manufacturers of furnace electrodes guarantee to deliver the electrodes to the furnace operator in good condition. From that point on, the responsibility for the care and use of the electrodes rests solely upon the operator.

The author discusses seven categories of the proper care and use of furnace electrodes; handling and storage; joint assembly; charging; influence of electrical conditions; thermal factors; excessive oxidation; and mechanical breakage.

## Heat Treatment

STEEL. (See Steel.)

STEEL CASTINGS. "Water Quenching Large Steel Castings," R. A. Gezelius, THE FOUNDRY, September, 1944, vol. 72, no. 9, pp. 74-77, 176, 178.

For many years liquid quenching, and in particular, water quenching, was thought to be too drastic for large steel castings. However, experience has proven that water quenching can be satisfactory for large steel castings provided certain factors are controlled. These factors are: (1) temperature of the casting as quenched; (2) severity of the quench (water temperature and water circulation); (3) time of immersion in the water; and (4) temperature and time of tempering after quenching.

The author describes various types of equipment and equipment layouts which have proven satisfactory for the water quenching of large steel castings.

## Magnesium

DEFECTS. "Microporosity," W. R. D. Jones, METAL INDUSTRY, September 8, 1944, vol. 65, no. 10, pp. 146-149.

It is believed that microporosity may be caused by two things: (1) liquid microshrinkage which takes place in the latter stages of solidification, and (2) tearing at the interface between the alpha solid solution and the beta constituent to withstand the contraction stresses during cooling after solidification. Porosity due to the first cause may be controlled by the designer and metallurgist. Porosity resulting from the sec-

ond cause may be an inherent property of the alloy. Magnesium-base alloys containing zinc are liable to microporosity, even if the casting is of the simplest design.

## Metal Forms

FABRICATING METHODS. "Materials and Methods Manual," Fred P. Peters, METALS AND ALLOYS, vol. 20, no. 1, July, 1944, pp. 89-104.

A compilation of data on the design features, advantages and disadvantages of the various methods of manufacturing small parts on a production basis.

Metal forms discussed are: sand castings, plaster mold castings, precision castings, permanent mold castings, die castings, drop forgings, press forgings, upset forgings, cold headed parts, impact extrusions, stampings, welded or brazed assemblies, screw machine parts, tubing products, extrusions, spinnings, powder metal parts, and molded plastics.

The cost, design and production of these various forms are discussed and compared.

## Methods of Fabrication

SMALL PARTS. (See Metal Forms.)

## Molding Practice

SANDSLINGERS. "Sandslinger Moulding Practice," W. Y. Buchanan, FOUNDRY TRADE JOURNAL, July 27, 1944, vol. 73, no. 1458, pp. 249-253; August 3, 1944, vol. 73, no. 1459, pp. 275-278.

In the first part of this article, the author compares the advantages and disadvantages of hand ramming, jolt ramming, squeezing, core blowing, and sandslinger molding. He reports the results of tests made on molds rammed by the foregoing methods in order to determine the hardness of the molds at varying distances from the top and bottom. Although the type of mold used was better suited to other methods of molding, the sandslinger produced the most uniform hardness throughout the mold.

In part two of this article, the author describes the technique of ramming with the aid of a sandslinger and discusses methods of feeding a sandslinger, types of molds to which it is adaptable, and time savings which result from its use.

## Radiography

INSPECTION. "Industrial X-ray Units," STEEL, September 25, 1944, vol. 115, no. 13, pp. 112, 114.

A description of production-scale inspection of loaded shells.

## Refractories

ALUMINUM MELTING. "Zircon Refractories for Aluminum Melting Furnaces," R. W. Knauff, THE REFRactories JOURNAL, no. 5, May, 1944, pp. 195-200.

Although aluminum is melted at comparatively low temperatures, its nature is such that many refractories' problems arise when it is melted in an open hearth

or reverberatory furnace. Zircon refractories seem to be the answer to all these problems.

This article describes the effects of molten aluminum on both firebrick and zircon refractories. It gives the properties of zircon bricks and the advantage of their use for aluminum melting.

## Sand

GAS EVOLUTION. "Gas Developed in Molds," Norman J. Dunbeck, THE FOUNDRY, September, 1944, vol. 72, no. 9, pp. 85-86, 178.

The author discusses tests performed to determine the amount of gas generated by various sand mixtures. Data obtained from these tests are tabulated. The safest condition within a mold, so far as freedom from casting defects is concerned, is a minimum of gas evolution by sand which has high hot permeability and a low back pressure.

## Steel

CARBON CONTENT. "Selecting Steels on the Basis of Carbon Content," A. S. Jameson, STEEL, August 14, 1944, vol. 115, no. 7, pp. 94-98, 100.

Tensile and microscopic data are presented to show that in the selection of a steel for a particular application, the primary consideration is choice of proper carbon content. Data on effect of other alloying elements are also included.

CONVERTER. "Developments in the Design and Use of Side-Blown Converter Plants," P. C. Fassotte, FOUNDRY TRADE JOURNAL, August 24, 1944, vol. 73, no. 1462, pp. 329-334.

Prior to the war over half of England's steel was produced in converter plants. With the onset of the war, the high-silicon iron used for converter iron was no longer available. Therefore experiments were undertaken to determine the true significance of the silicon reaction in the converter. It was found that in a side blown converter, the silicon acted principally as a kindling agent which brought the metal to a sufficiently high temperature to cause the carbon to react freely. Although in a bottom-blown converter the carbon reaction is principally a carbon monoxide reaction, in the side-blown converter it is principally a carbon dioxide reaction. Therefore, provided the metal is hot enough when poured into the converter, normal cupola iron may be used successfully to produce converter steel.

A plant in which converter steel is produced from low-silicon iron is described by the author.

ELECTRODES. (See Furnaces.)

HEAT TREATMENT. "Wartime Developments in Heat Treatment of Steel and Their Effect on Design," Harry W. McQuaid, STEEL, August 21, 1944, vol. 115, no. 8, pp. 123, 164-165.

Among the processes which have been either entirely or partially developed as a result of the war are induction and

flame hardening, isothermal heat treating, improved quenching, shot blasting, and controlled furnace atmospheres.

Induction hardening should be limited primarily to shallow hardening steels. The principal advantage of the induction heating is its application to localized areas. Flame hardening has similar applications, although it results in somewhat deeper hardening than induction heating.

Isothermal heat treating is governed by the following conditions of the proc-

ess: (1) a uniform temperature is approached throughout a part before any transformation starts; and (2) transformation occurs throughout the part at nearly the same time.

Controlled atmosphere heating has made it possible to produce parts which are free from surface decarburization.

Improved quenching practices have made it possible to eliminate undesirable stress conditions within parts or to develop certain desirable stresses.

MANUFACTURE. "Steel Making Meth-

ods for More and Better Steels," METAL PROGRESS, September, 1944, vol. 46, no. 3, pp. 478-483.

This consists of two articles describing the relative advantages of the open-hearth and electric processes for producing steel. These articles are "Basic Open-hearth as a Producer of Alloy and Special Steels," by C. D. King, and "Electric Furnace Quality Versus Openhearth," by Gilbert Soler.

WATER QUENCHING. (See Heat Treatment.)

## Schedule of November Chapter Meetings

### November 2

Saginaw Valley Section, Detroit  
Frankenmuth, Mich.  
NATHAN JANCO  
Centrifugal Casting Co.  
"Centrifugal Casting Methods"



### November 3

Western New York  
Hotel Touraine, Buffalo  
MAX KUNIANSKY  
Lynchburg Foundry Co.  
"Today's Cupola Operation and Scrap"



### November 6

Central Indiana  
Athenaeum, Indianapolis  
DR. J. A. RIDDERHOE  
"Use and Action of Core and Mold Castings"



### Chicago

Chicago Bar Association Restaurant  
ROUND TABLE MEETING  
Steel—W. A. LINCHESTER, Western  
Foundry Co.  
Gray Iron, Malleable & Pattern Div.—M. RINTZ, Continental Foundry &  
Machine Co.  
Non-Ferrous—L. G. JESSUP, Federated Metals Div., American Smelting & Refining Co.



### Metropolitan

Essex House, Newark, N. J.  
VAUGHAN REID  
City Pattern Foundry & Machine Co.  
"Metal Patterns for High Production  
Foundries"



### November 9

Northeastern Ohio  
Cleveland Club, Cleveland  
F. J. WALLS  
International Nickel Co.  
NATIONAL OFFICERS' NIGHT



### St. Louis

DeSoto Hotel, St. Louis  
W. E. JONES  
Ordnance Steel Foundry Co.  
"Atmospheric and Washburn Risers"

### Texas

San Antonio, Texas  
A. W. GREGG  
Whiting Corp.



### November 10

Central New York  
Hotel Onondaga, Syracuse  
N. J. DUNBECK  
Eastern Clay Products  
"How to Select a Bond Clay"



Northern California  
Engineers Club, San Francisco



### Philadelphia

NORMAN TISDALE  
Molybdenum Corp. of America  
"Boron in the Foundry Industry"



Wisconsin  
Schroeder Hotel, Milwaukee

LEE H. HILL  
Allis-Chalmers Mfg. Co.  
"Management Rights"



### Rochester

University of Rochester  
HERBERT MERMAGEN  
Ind. X-Ray Div., U. of Rochester  
"X-Ray Inspection and Its Application  
in the Foundry"



### November 13

Cincinnati  
Engineering Club of Cincinnati  
FRED J. WALLS  
International Nickel Co.  
"Future Foundrymen"  
NATIONAL OFFICERS' NIGHT



### Western Michigan

Ferry Hotel, Grand Haven, Mich.



### November 14

Michigan  
LaSalle Hotel, South Bend, Ind.  
ROUND TABLE MEETING  
"Melting Practice"

### Northern Illinois-Southern Wisconsin

Hotel Faust, Rockford

JAS. A. MURPHY

Jas. A. Murphy & Co.

"Compressed Air—Its Troubles and  
Remedies"



### Detroit

Rackham Educational Memorial,  
Detroit

ROUND TABLE MEETING

Gray Iron, Steel, Magnesium



### November 17

Eastern Canada and Newfoundland  
Mount Royal Hotel, Montreal

H. H. FAIRFIELD

Bureau of Mines, Ottawa  
"Foundry Research Laboratories of  
the Bureau of Mines"



### November 20

Quad City

Fort Armstrong Hotel, Rock Island

H. B. ORR

C. O. Bartlett Snow Co.

"Mechanization in the Foundry"



### November 24

Ontario

Royal Connaught Hotel, Hamilton

ROUND TABLE MEETING

Gray Iron, Non-Ferrous, Malleable,



Steel

"Casting Defects and Remedies"



### November 28

Toledo

Oilley's Night Club, Toledo

F. LEON MILLER

"Core Blowing Equipment and  
Methods"



### Twin City

Leamington Hotel, Minneapolis

JAS. H. LANSING

Malleable Founders Society

"Malleable Castings"



### November 30

Canton District Chapter

Elks Club, Canton

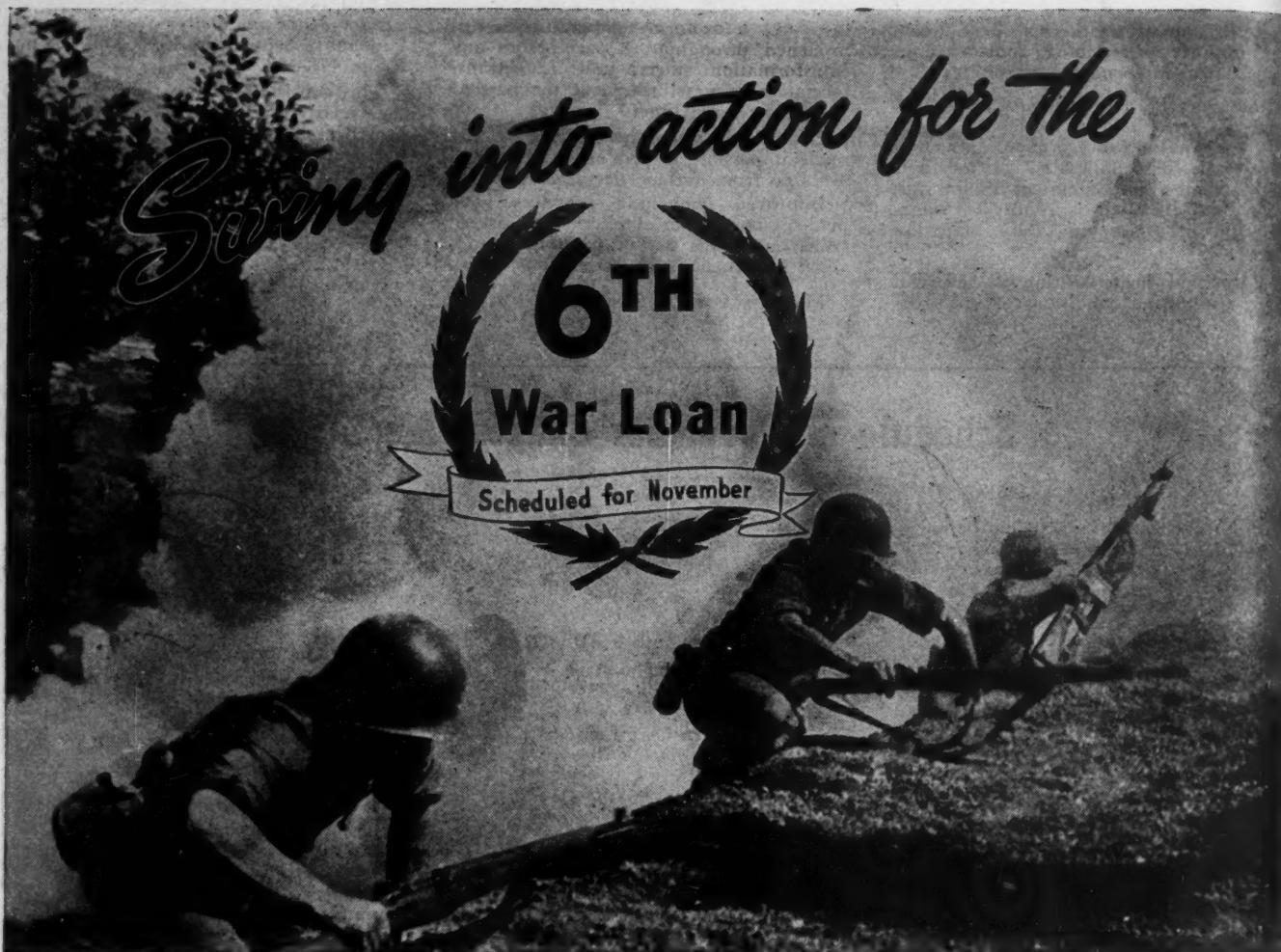
G. F. MALICK

Timken Vocational High School

"The Apprentice Problem"

ROUND TABLE MEETING

Gray Iron, Steel, Brass and Bronze



## PLAN YOUR PLANT DRIVE NOW!

Good organization will be needed to sell the 6th. The task of raising the huge sum required will be the most difficult ever asked of Industry. As each new military success brings us closer to Victory, the public naturally will feel that the urgency of war financing is lessened—whereas it isn't. So organize now to prevent a letdown on the home-front from causing a letdown on the fighting front. Build your plant's payroll campaign around this fighting 8-Point Plan. You don't have to wait for the official Drive to start—swing into action NOW!

- 1 BOND COMMITTEE**—Appoint a 6th War Loan Bond Committee from labor, management and each representative group of the firm.
- 2 TEAM CAPTAINS**—Select a team captain, for each 10 workers, from men and women on the payroll—but not in a supervisory capacity. Returned veterans make most effective captains.
- 3 QUOTA**—Set a quota for each department and each employee.
- 4 MEETING OF CAPTAINS**—Give a powerful presentation of the importance of the work assigned to them. Instruct them in sales procedure. Have them carefully study the Treasury Booklet, *Getting the Order*.
- 5 ASSIGNMENTS**—Assign responsibilities for:  
(a) *Music, speeches and announcements of the opening rally.*

(b) *Pre-drive letter to employees from management and labor.*  
(c) *Competitive progress boards.*  
(d) *Meeting schedules, etc.*

- 6 CARD FOR EACH WORKER**—Dignify each personal approach with a pledge, order, or authorization card made out in the name of each worker. Provide for a cash purchase or installment pledge. Instruct each captain to put a pencil notation on the card to indicate the subscription he expects to solicit from each worker.
- 7 RESOLICITATION**—People don't mind being asked to buy more than once. Resolicit each employee toward the end of the drive in a fast mop-up campaign. Call upon your State Payroll Chairman; he's ready with a fully detailed plan—NOW!
- 8 ADVERTISE THE DRIVE**—Use all possible space in the regular media you employ to tell the War Bond story.

*The Treasury Department acknowledges with appreciation the publication of this message by*

**AMERICAN FOUNDRYMAN**

*This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council*